LAW OFFICE OF
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September 30, 2015

Delivered via Electronic Mail

Mr. Eric Shaw
Environmental Manager
Standards Development Section
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 6511
Tallahassee, FL 32399-2400

Re: **Triennial Review of Water Quality Standards - Human Health Criteria**

Dear Mr. Shaw:

In accordance with section 303(c)(1) of the Clean Water Act, 33 U.S.C. § 1313(c)(1), and 40 C.F.R. § 131.20(a) (as amended by 80 Fed. Reg. 51046, 51049 (Aug. 21, 2015)), the Florida Department of Environmental Protection held public workshops on June 10 and 11, 2015 and September 15 and 16, 2015 "for the purpose of reviewing applicable water quality standards adopted [by the State] and Federally promulgated water quality standards and, as appropriate, modifying and adopting standards." 40 C.F.R. § 131.20(a). *See* F.A.R. 41/97, Section I (May 19, 2015) and F.A.R. 41/169, Section VI (Aug. 31, 2015). Written comments are to be submitted by October 1, 2015. These comments are submitted on behalf of the Florida Clean Water Network.

I. Background

A. Designated Uses of Waters

Section 303(c)(2)(A) of the Clean Water Act, 33 U.S.C. 1313(c)(2)(A), requires that new or revised water quality standards shall include designated uses of waters, taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes, and also taking into consideration their use and value for navigation. 40 C.F.R. § 131.10(a). Fla. Admin. Code R. 62-302.400 classifies all surface waters according to one or more of the following designated uses:

CLASS I	Potable Water Supplies
CLASS II	Shellfish Propagation or Harvesting
CLASS III	Fish Consumption; Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife

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CLASS III-Limited	Fish Consumption; Recreation or Limited Recreation; and/or Propagation and Maintenance of a Limited Population of Fish and Wildlife
CLASS IV	Agricultural Water Supplies
CLASS V	Navigation, Utility and Industrial Use

B. Water Quality Criteria

Section 303(c)(2)(A) of the Clean Water Act, 33 U.S.C. § 1313(c)(2)(A) requires that States adopt those water quality criteria that protect the designated use. Such criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use. 40 C.F.R. § 131.11(a). States must review water quality data and information on discharges to identify specific water bodies where toxic pollutants may be adversely affecting water quality or the attainment of the designated water use or where the levels of toxic pollutants are at a level to warrant concern and must adopt criteria for such toxic pollutants applicable to the water body sufficient to protect the designated use. In establishing criteria, States should establish numerical values based on section 304(a) Guidance, section 304(a) Guidance modified to reflect site-specific conditions, or other scientifically defensible methods. Where numerical criteria cannot be established or to supplement numerical criteria, States may establish narrative criteria or criteria based upon biomonitoring methods.

Section 304(a)(1) of the Clean Water Act, 33 U.S.C. § 1314(a)(1), requires EPA to develop and publish and, from time to time, revise recommended criteria for protection of water quality and human health that accurately reflect the latest scientific knowledge. Recommended water quality criteria developed under section 304(a) are based solely on data and scientific judgments on the relationship between pollutant concentrations and environmental and human health effects. EPA's recommended Section 304(a) criteria provide technical information for states and authorized tribes to consider and use in adopting water quality standards that ultimately provide the basis for assessing water body health and controlling discharges of pollutants into waters of the United States.

II. Florida's Human Health Criteria

Among the existing water quality standards adopted by the State of Florida are thirty-six water quality criteria for the protection of human health. *Final Baseline Risk Analysis for Chapter 62-302, F.A.C.* (Univ. of Fla. Ctr. for Envt'l & Human Toxicology, May 2008) at Table 1 (Exhibit A); Fla. Admin. Code R. 62-302.530 (Exhibit B). These criteria were adopted by the Florida Department of Environmental Regulation (now Florida Department of Environmental Protection) on December 7, 1990 and approved by EPA on February 25, 1992. *See* 57 Fed. Reg. 60848, 60900-60901 (Dec. 22, 1992).

The human health criteria were developed by the Florida Department of Environmental Regulation using the equations and factors described in *Final Baseline Risk Analysis for Chapter*

62-302, F.A.C. (Univ. of Fla. Ctr. for Envt'l & Human Toxicology, May 2008) at Appendix A (Exhibit C). The factors and values used by the Department are shown in Exhibit D and include the following:

FCR = fish consumption rate (6.5 g/day)
WCR = water consumption rate (2.0 L/day)
HBW = human body weight (70 kg)
CPF = cancer potency factor, in (kg-day)/mg (chemical-specific)
RfD = reference dose, in mg/(kg-day) (chemical-specific)
RSC = relative source contribution (chemical-specific)
BCF = bioconcentration factor, in l/kg (chemical-specific)
RL = risk level (1×10^{-6})

Since their adoption in 1990, the Florida human health criteria have not been revised or supplemented.

A. Fish Consumption Rates of General Population

Many of the human health criteria in Fla. Admin. Code R. 62-302.530 were derived using a freshwater and estuarine fish consumption rate of 6.5 g/day. *Final Baseline Risk Analysis for Chapter 62-302, F.A.C.* (Univ. of Fla. Ctr. for Envt'l & Human Toxicology, May 2008) at Appendix A (Exhibit C). This rate is based on an analysis of the National Purchase Diary Fish Consumption Survey conducted by NPD Research, Inc. in 1973-74 for the Tuna Research Institute. *Guidelines and Methodology Used in the Preparation of Health Effects Assessment Chapters of the Consent Decree Water Criteria Documents*, 45 Fed. Reg. 79347, 79348 (Nov. 28, 1980); *Exposure Factors Handbook* (EPA/000/8-89/043, March 1990) at 2-28 & 2-31.

Since the adoption of human health criteria in Rule 62-302.530, EPA has updated its national recommended fish consumption rate twice. In October 2000, EPA recommended a national "default fish intake rate of 17.5 grams/day to adequately protect the general population of fish consumers" based on the *1994–1996 Continuing Survey of Food Intakes by Individuals and 1994–1996 Diet and Health Knowledge Survey* (USDA, 1998). *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B-00-004, Oct. 2000) at 4-25. *See* 65 Fed. Reg. 66444, 66452 (Nov. 3, 2000). On June 29, 2015, EPA updated its national recommended consumption rate of freshwater and estuarine finfish and shellfish to 22 g/day, based on an analysis of NHANES data from 2003 to 2010 in *Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010)* (EPA-820-R-14-002, Apr. 2014) at Table 9b (Exhibit E). *Human Health Ambient Water Quality Criteria: 2015 Update* (EPA 820-F-15-001, June 2015) (Exhibit F); 80 Fed. Reg. 36986 (June 29, 2015).

In addition, EPA strongly emphasizes that States and authorized Tribes should consider developing criteria to protect highly exposed population groups and use local or regional data

over the default values as more representative of their target population group(s). The four preference hierarchy is: (1) use of local data; (2) use of data reflecting similar geography/ population groups; (3) use of data from national surveys; and (4) use of EPA's default intake rates. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B-00-004, Oct. 2000) at 4-24 to 4-25; *Human Health Ambient Water Quality Criteria: 2015 Update* (EPA 820-F-15-001, June 2015) (Exhibit F).

On August 31, 1994, the Florida Agricultural Market Research Center at the University of Florida published the results of a 7-day recall survey performed between March 15, 1993 and March 13, 1994. The study was commissioned by the Florida Department of Environmental Protection in 1992. The fish consumption habits of three survey populations were examined: the general population across the state; the general population communities where paper mills are located; and households receiving food stamps. *Per Capita Fish and Shellfish Consumption in Florida, Industry Report 94-2* (Univ. of Fla. Agric. and Mkt. Research Ctr., Aug. 31, 1994).

On July 21, 1995, the Legal Environmental Assistance Foundation, Inc., Florida Wildlife Federation, Florida League of Anglers, Inc., and Sierra Club - Florida Chapter submitted to the Florida Department of Environmental Protection a *Petition for Amendment of Fla. Admin. Code R. 62-302.530, Criteria for Surface Water Quality Classifications*. The Petition sought the revision of thirty-one water quality criteria for the protection of human health based on the mean finfish and shellfish consumption rate of 46.0 g/day reported in *Per Capita Fish and Shellfish Consumption in Florida, Industry Report 94-2* (Univ. of Fla. Agric. and Mkt. Research Ctr., Aug. 31, 1994). On October 25, 1995, the Department granted the petition "to the extent that the Department has already begun rule development to adopt stricter surface water quality criteria as proposed," but denied initiation of proposed rulemaking as "premature." Over the next twenty years the Department engaged in numerous workshops and ever-changing analyses of all factors from which human health criteria might be derived, but has yet to adopt revised human health criteria.

The data collected for *Per Capita Fish and Shellfish Consumption in Florida, Industry Report 94-2* (Univ. of Fla. Agric. and Mkt. Research Ctr., Aug. 31, 1994) were further analyzed were further analyzed by the University of Florida Center for Environmental & Human Toxicology to generate the fish consumption rate distributions reported in *Final Baseline Risk Analysis for Chapter 62-302, F.A.C.* (Univ. of Fla. Ctr. for Envt'l & Human Toxicology, May 2008) at Table 10 (Exhibit G). This analysis indicates that the 90th percentile distribution for consumers and non-consumers of Florida fish species (freshwater fish and marine species known to occur in nearshore waters off Florida) was 63.5 g/day. This local data is to be preferred over the EPA's national recommended default fish consumption rate.

The data collected for *Per Capita Fish and Shellfish Consumption in Florida, Industry Report 94-2* (Univ. of Fla. Agric. and Mkt. Research Ctr., Aug. 31, 1994) were analyzed by the EPA to generate the fish consumption rate distributions reported in *Fish Consumption in Connecticut, Florida, Minnesota, and North Dakota* (EPA/600/R-13/098F, Aug. 2013). This

analysis indicates that the 90th percentile distribution of per capita consumption of freshwater and estuarine fish (uncooked) was 28 g/day. *Id.* at Table E-96 (Exhibit H). However, EPA repeatedly cautioned that the manner in which the data were collected made it likely to undersestimate consumption. *E.g.*, *id.* at 3-25 ("The Florida survey collected away-from-home fish consumption for the randomly selected adult respondent, but not for other adults in the household and not for children. As a result, the estimated per capita fish and shellfish consumption in Florida is likely to underestimate the true amount."). *See id.* at ES-3, 1-5, 3-6, 3-22, and A-2. This local data is to be preferred over the EPA's national recommended default fish consumption rate.

In addition, an EPA analysis of NHANES data from 2003-2010 determined that the 90th percentile consumption rates of freshwater and estuarine finfish and shellfish for the Gulf of Mexico and Atlantic coastal/inland regions were 28.6 g/day and 30.8 g/day, respectively. *Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010)* (EPA-820-R-14-002, April 2014) at Table 9b (Exhibit E). These regional data are to be preferred over the EPA's national recommended default fish consumption rate.

Summary of General Population Fish Consumption Data

Fish Consumption Rate	Citation	Basis
22 g/day	*Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010)*, (EPA-820-R-14-002, Apr. 2014) at Table 9b	90th percentile of National per capita consumption of freshwater and estuarine finfish and shellfish (uncooked) based on National Health and Nutrition Examination Survey (NHANES) 2003-2010
63.47 g/day	*Final Baseline Risk Analysis for Chapter 62-302, F.A.C.* (Univ. of Fla. Ctr. for Envt'l & Human Toxicology, May 2008) at Table 10	90th percentile of Florida per capita consumption of Florida freshwater and nearshore fish species based on reanalysis of data from *Per Capita Fish and Shellfish Consumption in Florida, Industry Report 94-2* (Univ. of Fla. Agric. and Mkt. Research Ctr., Aug. 31, 1994)

28 g/day	*Fish Consumption in Connecticut, Florida, Minnesota, and North Dakota* (EPA/600/R-13/ 098F, Aug. 2013) at Table E-96	90th percentile of Florida per capita consumption of freshwater and estuarine fish (uncooked) based on reanalysis of data from *Per Capita Fish and Shellfish Consumption in Florida, Industry Report 94-2* (Univ. of Fla. Agric. and Mkt. Research Ctr., Aug. 31, 1994)
28.6-30.8 g/day	*Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010)* (EPA-820-R-14-002, Apr. 2014) at Table 9b	90th percentile of Gulf of Mexico and Atlantic coastal/inland regions per capita consumption of freshwater and estuarine finfish and shellfish (uncooked) based on National Health and Nutrition Examination Survey (NHANES) 2003-2010

B. Fish Consumption Rates of Highly Exposed Populations

EPA also requires that highly exposed populations be protected from cancer risks that exceed 10^{-4}. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B-00-004, Oct. 2000) at 2-6. "States and authorized Tribes may use either high-end values (such as the 90th or 95th percentile values) or average values for an identified population that they plan to protect (*e.g.*, subsistence fishers, sport fishers, or the general population)." *Id.* at 4-25.

In October 2000, EPA recommended that the national fish consumption rate for subsistence fishers be 142 g/day based on the 99th percentile of data from *1994–1996 Continuing Survey of Food Intakes by Individuals and 1994–1996 Diet and Health Knowledge Survey* (USDA, 1998). *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B-00-004, Oct. 2000) at 4-24 to 4-27.

The fish consumption rate distributions generated from data collected in the *Per Capita Fish and Shellfish Consumption in Florida, Industry Report 94-2* (Univ. of Fla. Agric. and Mkt. Research Ctr., Aug. 31, 1994) were further analyzed by the University of Florida Center for Environmental & Human Toxicology. This analysis indicates that the 99th percentile consumption rate of Florida freshwater and nearshore fish species is 154 g/day. *Final Baseline Risk Analysis for Chapter 62-302, F.A.C.* (Univ. of Fla. Ctr. for Envt'l & Human Toxicology, May 2008) at Table 10 (Exhibit G). This local data is to be preferred over EPA's national recommended fish consumption rate for subsistence fishers.

The data collected for *Per Capita Fish and Shellfish Consumption in Florida, Industry Report 94-2* (Univ. of Fla. Agric. and Mkt. Research Ctr., Aug. 31, 1994) were analyzed by the EPA to generate the fish consumption rate distributions reported in *Fish Consumption in Connecticut, Florida, Minnesota, and North Dakota* (EPA/600/R-13/098F, Aug. 2013). This analysis indicates that the 99th percentile distribution of per capita consumption of freshwater and estuarine fish (uncooked) was 177 g/day. *Id.* at Table E-96 (Exhibit H). However, EPA repeatedly cautioned that the manner in which the data were collected made it likely to undersestimate consumption. *E.g.*, *id.* at 3-25 ("The Florida survey collected away-from-home fish consumption for the randomly selected adult respondent, but not for other adults in the household and not for children. As a result, the estimated per capita fish and shellfish consumption in Florida is likely to underestimate the true amount."). *See id.* at ES-3, 1-5, 3-6, 3-22, and A-2. Nevertheless, this local data is to be preferred over EPA's national recommended fish consumption rate for subsistence fishers.

In addition, an EPA analysis of NHANES data from 2003-2010 determined that the 99th percentile consumption rate of freshwater and estuarine finfish and shellfish for the Gulf of Mexico and Atlantic coastal/inland regions was 73.8 g/day and 75.8 g/day, respectively. *Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010)* (EPA-820-R-14-002, April 2014) at Table 9b (Exhibit E).

Summary of Highly Exposed Population Fish Consumption Data

Fish Consumption Rate	Citation	Basis
142 g/day	*Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B-00-004, Oct. 2000) at 4-24 to 4-27	99th percentile of National per capita consumption of freshwater and estuarine finfish and shellfish (uncooked) from analysis of *1994–1996 Continuing Survey of Food Intakes by Individuals and 1994–1996 Diet and Health Knowledge Survey* (USDA, 1998)
154.4 g/day	*Final Baseline Risk Analysis for Chapter 62-302, F.A.C.* (Univ. of Fla. Ctr. for Envt'l & Human Toxicology, May 2008) at Table 10	99th percentile of Florida per capita consumption of Florida freshwater and nearshore fish species based on reanalysis of data from *Per Capita Fish and Shellfish Consumption in Florida, Industry Report 94-2* (Univ. of Fla. Agric. and Mkt. Research Ctr., Aug. 31, 1994)

177 g/day	*Fish Consumption in Connecticut, Florida, Minnesota, and North Dakota* (EPA/600/R-13/ 098F, Aug. 2013) at Table E-96	99th percentile of Florida per capita consumption of freshwater and estuarine fish (uncooked) based on reanalysis of data from *Per Capita Fish and Shellfish Consumption in Florida, Industry Report 94-2* (Univ. of Fla. Agric. and Mkt. Research Ctr., Aug. 31, 1994)
73.8-75.8 g/day	*Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010)* (EPA-820-R-14-002, Apr. 2014) at Table 9b	99th percentile of Gulf of Mexico and Atlantic coastal/inland regions per capita consumption of freshwater and estuarine finfish and shellfish (uncooked) based on National Health and Nutrition Examination Survey (NHANES) 2003-2010

C. Water Consumption Rate

Many of the human health criteria in Fla. Admin. Code R. 62-302.530 were derived using a water consumption rate of 2 liters per day. *Final Baseline Risk Analysis for Chapter 62-302, F.A.C.* (Univ. of Fla. Ctr. for Envt'l & Human Toxicology, May 2008) at Appendix A (Exhibit C). This water consumption rate has its origin in the 1977 publication *Drinking Water and Health* (Nat'l Acad. Sciences, 1977) referenced in *Guidelines and Methodology Used in the Preparation of Health Effects Assessment Chapters of the Consent Decree Water Criteria Documents*, 45 Fed. Reg. 79347, 79324 (Nov. 28, 1980). *See National Toxics Rule*, 57 Fed. Reg. 60848, 60863 (Dec. 22, 1992); *Exposure Factors Handbook* (EPA/000/8-89/043, March 1990) at 2-1 to 2-2.

This value was reaffirmed in EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B- 00-004, Oct. 2000) at 4-22 to 4-23. This value represented the per capita community water ingestion rate at the 86th percentile for adults surveyed in the U.S. Department of Agriculture's 1994-1996 Continuing Survey of Food Intake by Individuals (CSFII) analysis and the 88th percentile of adults in the National Cancer Institute study of the 1977-1978 Nationwide Food Consumption Survey.

In 2015, EPA revised the default drinking water consumption rate to 2.4 liters per day, rounded from 2.414 liters/day, based on NHANES data from 2003 to 2006 as reported in EPA's *Exposure Factors Handbook* (EPA-600-R-09-052F, 2011) at Table 3-23. *Human Health Ambient Water Quality Criteria: 2015 Update* (EPA 820-F-15-001, June 2015) (Exhibit F); 80

Fed. Reg. 36986 (June 29, 2015). This rate represents the per capita estimate of combined direct and indirect community water ingestion at the 90th percentile for adults ages 21 and older. EPA selected the per capita rate for the updated water consumption rate because it represents the average daily dose estimates; that is, it includes both people who drank water during the survey period and those who did not, which is appropriate for a national-scale assessment such as CWA section 304(a) national human health criteria development.

The 2.4 liters per day water consumption rate is derived from national data, *i.e.*, it is not region-specific. It is very likely that in hotter regions of the country like Florida where water loss due to urination, perspiration, and respiration may be higher, consumption of water may also be higher.

D. Body Weight

Many of the human health criteria in Fla. Admin. Code R. 62-302.530 were derived using a human body weight of 70 kg (154 lbs). This body weight has its origin in the 1957 *Report of the Task Group on Reference Man* (Int'l Comm'n for Radiation Prot., 1957) referenced in *Guidelines and Methodology Used in the Preparation of Health Effects Assessment Chapters of the Consent Decree Water Criteria Documents*, 45 Fed. Reg. 79347, 79324 (Nov. 28, 1980). This body weight was also used by EPA in the *National Toxics Rule*, 57 Fed. Reg. 60848, 60863 (Dec. 22, 1992).

This value was reaffirmed in EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B- 00-004, Oct. 2000) at 4-19 based on an examination of the third National Health and Nutrition Examination Survey (NHANES III) survey data collected from 1988 to 1994. In the analysis of the NHANES III database, median and mean values for female adults 18-74 years old are 65.8 and 69.5 kg, respectively. For males in the same age range, the median and mean values are 79.9 and 82.1 kg, respectively. The mean body weight value for men and women ages 18 to 74 years old from this survey is 75.6 kg.

In EPA's *Exposure Factors Handbook* (EPA-600-R-09-052F, 2011) at Table 8-1, EPA recommends a mean body weight for adults of 80 kg based on an examination of National Health and Nutrition Examination Survey (NHANES) data from 1999 to 2006. EPA cautions however,

> The mean recommended value for adults (80 kg) is different from the 70 kg commonly assumed in U.S. EPA risk assessments. Assessors are encouraged to use values that most accurately reflect the exposed population. When using values other than 70 kg, however, the assessors should consider if the dose estimate will be used to estimate risk by combining it with a dose-response relationship that was derived assuming a body weight of 70 kg. If such an inconsistency exists, the assessor may need to adjust the dose-response relationship as described in the appendix to Chapter 1.

Id. at 8-1.

In 2015, EPA revised the default body weight used in determining national recommended water quality criteria to 80 kg in accordance with the *Exposure Factors Handbook* (EPA-600-R-09-052F, 2011). *Human Health Ambient Water Quality Criteria: 2015 Update* (EPA 820-F-15-001, June 2015) (Exhibit F); 80 Fed. Reg. 36986 (June 29, 2015).

E. Bioaccumulation Factors (BAFs)

Most of the human health criteria in Fla. Admin. Code R. 62-302.530 were derived using chemical-specific bioconcentration factors. Exhibit D. The term *bioconcentration* refers to the uptake and retention of a chemical by an aquatic organism from the water column only.

In order to prevent harmful exposures to waterborne chemicals through the consumption of contaminated fish and shellfish, national recommended water quality criteria for the protection of human health must address the process of chemical bioaccumulation in aquatic organisms. The term *bioaccumulation* refers to the uptake and retention of a chemical by an aquatic organism from all surrounding media, such as water, food, and sediment. For some chemicals (particularly those that are highly persistent and hydrophobic), the magnitude of bioaccumulation by aquatic organisms can be substantially greater than the magnitude of bioconcentration. Thus, an assessment of bioconcentration alone might underestimate the extent of accumulation in aquatic biota for those chemicals.

For deriving national recommended criteria to protect human health, EPA accounts for potential bioaccumulation of chemicals in fish and shellfish through the use of national bioaccumulation factors (BAFs). The guidelines presented in EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA-822-B- 00-004, Oct. 2000) emphasize using, when possible, measured or estimated Bioaccumulation Factors (BAFs) which account for chemical accumulation in aquatic organisms from all potential exposure routes. *Id.* at 5-2.

In June 2015, EPA estimated BAFs for national recommended water quality criteria using the EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* and its *Technical Support Document, Volume 2: Development of National Bioaccumulation Factors, (Technical Support Document, Volume 2)* (EPA-822-R-03-030, Dec. 2003). Specifically, these documents provide a framework for identifying alternative procedures to derive national Trophic Level-specific BAFs for a chemical based on the chemical's properties (*e.g.*, ionization and hydrophobicity), metabolism, and biomagnification potential. EPA's approach for developing national BAFs represents the long-term average bioaccumulation potential of a pollutant in aquatic organisms that are commonly consumed by humans across the United States. National BAFs are not intended to reflect fluctuations in bioaccumulation over short periods (*e.g.*, a few days) because human health water quality criteria are generally designed to protect humans from long-term (lifetime) exposures to waterborne chemicals. EPA's

national recommended BAF's appear in *Chemical-specific Inputs for the 2015 Final Updated Human Health Ambient Water Quality Criteria* (EPA, June 2015) (Exhibit I).

F. Relative Source Contribution

Most of the human health criteria in Fla. Admin. Code R. 62-302.530 were derived without consideration of any Relative Source Contribution (RSC). The RSC allows a percentage of the reference dose's exposure to be attributed to ambient water and fish consumption (including fish and shellfish from inland and nearshore waters) when there are other potential exposure sources. The rationale for this approach is that the objective of the water quality criteria is to ensure that an individual's total exposure from all sources does not exceed the criteria. Exposures outside of the RSC include, but are not limited to, exposure to a particular pollutant from ocean fish consumption (not included in the fish consumption rate), non-fish food consumption (meats, poultry, fruits, vegetables, and grains), dermal exposure, and respiratory exposure. As shown in Exhibit D, only three chemicals in Rule 62-302.530 have been assigned an RSC of less than 1.0: Antimony, Thallium, and 1,1-Dichloroethylene.

In June 2015, EPA updated the national recommended human health criteria to reflect chemical-specific RSCs ranging from 20 to 80 percent following the Exposure Decision Tree approach described in EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health*. EPA recommends inclusion of an RSC when developing human health criteria for threshold non-carcinogens and non-linear carcinogens. As reflected in *Chemical-specific Inputs for the 2015 Final Updated Human Health Ambient Water Quality* (EPA, June 2015) (Exhibit I), EPA recommends an RSC of less than 1.0 for eighty toxic pollutants.

G. Cancer Potency Factors and Reference Doses

Many of the human health criteria in Fla. Admin. Code R. 62-302.530 were derived using a Reference Dose (RfD) of a non-carinogenic toxic pollutant or a Cancer Slope Factor (CSF) of a carcinogenic toxic pollutant. The chemical-specific RfDs and CSFs previously used by the Florida Department of Environmental Regulation (now Florida Department of Environmental Protection) appear at Exhibit D.

For noncarcinogenic toxicological effects, EPA uses a chronic-duration oral RfD to derive recommended human health criteria. An RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure of the human population to a substance that is likely to be without an appreciable risk of deleterious effects during a lifetime. An RfD is typically derived from a laboratory animal dosing study in which a no-observed-adverse-effect level (NOAEL), lowest-observed-adverse-effect level (LOAEL), or benchmark dose can be obtained. Uncertainty factors are applied to reflect the limitations and uncertainties of the data.

For carcinogenic toxicological effects, EPA uses an oral CSF to derive recommended human health criteria. The oral CSF is an upper bound, approximating a 95 percent confidence limit, on the increased cancer risk from a lifetime oral exposure to a stressor.

EPA recently reviewed the scientific literature and determined RfDs and CSFs for ninety-four toxic pollutants. *Chemical-specific Inputs for the 2015 Final Updated Human Health Ambient Water Quality Criteria* (June 2015) Exhibit I.

H. Federally promulgated criteria

Among the Federally promulgated water quality standards for Florida are water quality criteria for 2,3,7,8-TCDD (Dioxin). 40 C.F.R. §§ 131.36(d)(6). These criteria were promulgated by EPA in 1992. 57 Fed. Reg. 60848, 60919 (Dec. 22, 1992). These criteria were also based on EPA's national default fish consumption rate of 6.5 g/day, national default water consumption rate 2.0 L/day, and national default human body weight of 70 kg. 57 Fed. Reg. 60848, 60863 (Dec. 22, 1992). In addition, the criteria were based on a bioconcentration factor rather than a bioaccumulation factor, and no relative source contribution. As discussed above, many of these factors and methodologies have been updated since 1992. Accordingly, revised criteria for 2,3,7,8-TCDD (Dioxin) are necessary to protect the designated uses of Florida's waters.

III. Conclusion

States and authorized tribes must adopt water quality criteria that protect designated uses. 40 C.F.R. § 131.11(a)(1). Criteria must be based on a sound scientific rationale and contain sufficient parameters or constituents to protect the designated uses. *Id.* It is important for states and authorized tribes to consider any new or updated section 304(a) recommended criteria as part of their triennial review process to ensure that state or tribal water quality criteria reflect sound science and protect applicable designated uses.

40 C.F.R. § 131.20(a) (as amended by 80 Fed. Reg. 51046 (Aug. 21, 2015)) provides that "if a State does not adopt new or revised criteria for parameters for which EPA has published new or updated CWA section 304(a) criteria recommendations, then the State shall provide an explanation when it submits the results of its triennial review to the Regional Administrator consistent with CWA section 303(c)(1) and the requirements of § 131.20(c)."

Current State-adopted water quality criteria appear at Fla. Admin. Code R. 62-302.530. Florida's current human health criteria and the factors used in their derivation are shown in Exhibit D. The current State-adopted criteria do not reflect consideration of the new or updated EPA criteria recommendations at 80 Fed. Reg. 36987-36989 (June 29, 2015). Nor do the current State-adopted criteria reflect consideration of local or regional fish consumption rates for the general population and highly exposed populations. More importantly, the current State-adopted human health criteria are no longer based on sound scientific rationale and do not contain

sufficient parameters or constituents to protect the designated uses of Florida's waters. Accordingly, new or revised human health criteria should be promptly promulgated.

Sincerely,

David A. Ludder

IX. TABLES

Table 1 Chemicals in Chapter 672-302, F.A.C. with Standards Based on Human Health Endpoints		
Antimony	Thallium	Chlordane
Beryllium	Benzene	DDT
1,1-dichloroethylene (1,1-dichloroethene)	Carbon tetrachloride	Dieldrin
Chloroform	Dichloromethane (methylene chloride)	Heptachlor
2-chlorophenol	2,4-dinitrotoluene	Lindane (g-benzene hexachloride)
2,4-dichlorophenol	Bromoform	Pentachlorophenol
2,4-dinitrophenol	Chlorodibromomethane	2,4,6-trichlorophenol
Acenaphthene	Chloromethane (methyl chloride)	Polychlorinated Biphenyls (PCBs)
Anthracene	Dichlorobromomethane	Polycyclic Aromatic Hydrocarbons (PAHs). Total of: Acenaphthylene; Benzo(a)anthracene; Benzo(a)pyrene; Benzo(b)fluoranthene; Benzo(ghi)perylene; Benzo(k)fluoranthene; Chrysene; Dibenzo-(a,h)anthracene; Indeno(1,2,3-cd)pyrene; and Phenanthrene
Fluoranthene	Hexachlorobutadiene	1,1,2,2-Tetrachloroethane
Fluorene	Aldrin	Tetrachloroethylene (1,1,2,2-tetrachloroethene)
Pyrene	Betahexachlorocyclohexane (b-BHC)	Trichloroethylene (trichloroethene)

Source: Final Baseline Risk Analysis for Chapter 62-302, F.A.C. (FDEP, May 2008)

EXHIBIT

B

62-302.530 Table: Surface Water Quality Criteria.

The following table contains both numeric and narrative surface water quality criteria to be applied except within zones of m ixing. The left-hand column of the Table is a list of constituents for which a su rface water criterion exists. The headings for the water quality classifications are found at the top of the Table, and the classification descriptions for the headings are specified in subsection 62-302.400(1), F.A.C. Applicable criteria lie within the Ta ble. The individual criteria should be read in conjunction with other provisions in water quality standards, including Rule 62 -302.500, F.A.C. The criteria contained in Rule 62 -302.500, F.A.C., also apply to all waters unless alternative or more stringent criteria are specified in Rule 62-302.530, F.A.C. Unless otherwise stated, all criteria express the maximum not to be exceeded at any time except within established mixing zones or in accordance with site - specific effluent limitations developed pursuant to Rule 62-620.620, F.A.C. In some cases, there are separate or additional limits, which apply independently of the maximum not to be exceeded at any time. For example, the criteria for carcinogens, which are expressed as an annual average (denoted as "annua l avg." in the Table) , are applied as the maximum allowable annual average concentration at the long-term harmonic mean flow (see subsection 62-302.200(2), F.A.C.). Numeric interpretations of the narrative nutrient criterion in paragraph 62 -302.530(47)(b), F.A.C., shall be expressed as spatial averages and applied over a spatial area consistent with their derivation. In applying the water quality standards, the Department shall take into account the variability occurring in nature and shall recognize the st atistical variability inherent in sampling and testing procedures. The Department's assessment methodology, set forth in Chapter 62 -303, F.A.C., accounts for such natural and statistical variability when used to assess ambient waters pursuant to sections 305(b) and 303(d) of the Federal Clean Water Act.

Criteria for Surface Water Quality Classifications

Parameter	Units	Class I	Class II	Class III and Class III-Limited (see Note 4)		Class IV	Class V
				Predominantly Fresh Waters	Predominantly Marine Waters		
(1) Alkalinity	Milligrams/L as $CaCO_3$	Shall not be depressed below 20		Shall not be depressed below 20		≤ 600	
(2) Aluminum	Milligrams/L		≤ 1.5		≤ 1.5		
(3) Ammonia (un-ionized)	Milligrams/L as NH_3	≤ 0.02		≤ 0.02			
(4) Antimony	Micrograms/L	≤ 14.0	≤ 4,300	≤ 4,300	≤ 4,300		
(5)(a) Arsenic (total)	Micrograms/L	≤ 10	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50
(5)(b) Arsenic (trivalent)	Micrograms/L measured as total recoverable Arsenic		≤ 36		≤ 36		

(6) Bacteriological Quality (Fecal7 Coliform Bacteria)	Number per 100 ml (Most Probable Number (MPN) or Membrane Filter (MF))	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 5 samples taken over a 30 day period.	MPN or MF counts shall not exceed a median value of 14 with not more than 10% of the samples exceeding 43 (for MPN) or 31 (for MF), nor exceed 800 on any one day. To determine the percentage of samples exceeding the criteria when there are both MPN and MF samples for a waterbody, the percent shall be calculated as $100*(n_{mpn}+n_{mf})/N$, where n_{mpn} is the number of MPN samples greater than 43, n_{mf} is the number of MF samples greater than 31, and N is the total number of MPN and MF samples.	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period.	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period.		
(7) Barium	Milligrams/L	$\leq$ 1					
(8) Benzene	Micrograms/L	$\leq$ 1.18	$\leq$ 71.28 annual avg.	$\leq$ 71.28 annual avg.	$\leq$ 71.28 annual avg.		

(9) Beryllium	Micrograms/L	≤ 0.0077 annual avg.	≤ 0.13 annual avg.	≤ 0.13 annual avg.	≤ 0.13 annual avg.	≤ 100 in waters with a hardness in mg/L of $CaCO_3$ of less than 250 and shall not exceed 500 in harder waters	
(10)(a) Biological Health (Shannon-Weaver Diversity Index using Hester-Dendy type samplers)	Per cent reduction of Shannon-Weaver Diversity Index	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of background levels as measured using organisms retained by a U. S. Standard No. 30 sieve and collected and composited from a minimum of three Hester-Dendy type artificial substrate samplers of 0.10 to 0.15 m^2 area each, incubated for a period of four weeks.		The Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U. S. Standard No. 30 sieve and collected and composited from a minimum of three Hester-Dendy type artificial substrate samplers of 0.10 to 0.15 m^2 area each, incubated for a period of four weeks.			

(10) (b) Biological Health (Shannon-Weaver Diversity Index using Ekman or Ponar type samplers)	Per cent reduction of Shannon-Weaver Diversity Index	In lakes, the Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U.S. Standard No. 30 sieve and collected and composited from a minimum of three natural substrate samples, taken with Ekman or Ponar type samplers with minimum sampling area of 225 cm^2.	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U.S. Standard No. 30 sieve and collected and composited from a minimum of three natural substrate samples, taken with Ponar type samplers with minimum sampling area of 225 cm^2.	In lakes, the Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U.S. Standard No. 30 sieve and collected and composited from a minimum of three natural substrate samples, taken with Ekman or Ponar type samplers with minimum sampling area of 225 cm^2.	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U.S. Standard No. 30 sieve and collected and composited from a minimum of three natural substrate samples, taken with Ponar type samplers with minimum sampling area of 225 cm^2.		
(11) BOD (Biochemical Oxygen Demand)		Shall not be increased to exceed values which would cause dissolved oxygen to be depressed below the limit established for each class and, in no case, shall it be great enough to produce nuisance conditions.					
(12) Boron	Milligrams/L					$\leq$ 0.75	
(13) Bromates	Milligrams/L		$\leq$ 100		$\leq$ 100		
(14) Bromine (free molecular)	Milligrams/L		$\leq$ 0.1		$\leq$ 0.1		
(15) Cadmium	Micrograms/L See Notes (1) and (3).	Cd $\leq$ $e^{(0.7409[\ln H]-4.719)}$;	$\leq$ 8.8	Cd $\leq$ $e^{(0.7409[\ln H]-4.719)}$;	$\leq$ 8.8		
(16) Carbon tetrachloride	Micrograms/L	$\leq$ 0.25 annual avg.; 3.0 max	$\leq$ 4.42 annual avg.	$\leq$ 4.42 annual avg.	$\leq$ 4.42 annual avg.		

(17) Chlorides	Milligrams/L	≤ 250	Not increased more than 10% above normal background. Normal daily and seasonal fluctuations shall be maintained.		Not increased more than 10% above normal background. Normal daily and seasonal fluctuations shall be maintained.		In predominantly marine waters, not increased more than 10% above normal back-ground. Normal daily and seasonal fluctuations shall be main-tained.
(18) Chlorine (total residual)	Milligrams/L	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01		
(19)(a) Chromium (trivalent)	Micrograms/L measured as total recoverable Chromium See Notes (1) and (3).	Cr (III) ≤ $e^{(0.819[\ln H]+0.6848)}$		Cr (III) ≤ $e^{(0.819[\ln H]+0.6848)}$		Cr (III) ≤ $e^{(0.819[\ln H]+0.6848)}$	In predominantly fresh waters, ≤ $e^{(0.819[\ln H]+0.6848)}$
(19)(b) Chromium (hexavalent)	Micrograms/L See Note (3)	≤ 11	≤ 50	≤ 11	≤ 50	≤ 11	In predominantly fresh waters, ≤ 11. In predominantly marine waters, ≤ 50
(20) Chronic Toxicity (see definition in subsection 62-302.200(5), F.A.C. and also see below, “Substances in concentrations which...”)							

(21) Color, etc. (see also Minimum Criteria, Odor, Phenols, etc.)	Color, odor, and taste producing substances and other deleterious substances, including other chemical compounds attributable to domestic wastes, industrial wastes, and other wastes					Only such amounts as will not render the waters unsuitable for agricultural irrigation, livestock watering, industrial cooling, industrial process water supply purposes, or fish survival.	
(22) Conductance, Specific	Micromhos/cm	Shall not be increased more than 50% above background or to 1275, whichever is greater.		Shall not be increased more than 50% above background or to 1275, whichever is greater.		Shall not be increased more than 50% above background or to 1275, whichever is greater.	Shall not exceed 4,000
(23) Copper	Micrograms/L See Notes (1) and (3).	$Cu \leq e^{(0.8545[\ln H]-1.702)}$	≤ 3.7	$Cu \leq e^{(0.8545[\ln H]-1.702)}$	≤ 3.7	≤ 500	≤ 500
(24) Cyanide	Micrograms/L	≤ 5.2	≤ 1.0	≤ 5.2	≤ 1.0	≤ 5.0	≤ 5.0
(25) Definitions (see Section 62-302.200, F.A.C.)							
(26) Detergents	Milligrams/L	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5
(27) 1,1-Dichloroethylene (1,1-dichloroethene)	Micrograms/L	≤ 0.057 annual avg.; ≤ 7.0 max	≤ 3.2 annual avg.	≤ 3.2 annual avg.	≤ 3.2 annual avg.		
(28) Dichloromethane (methylene chloride)	Micrograms/L	≤ 4.65 annual avg.	≤ 1,580 annual avg.	≤ 1,580 annual avg.	≤ 1,580 annual avg.		
(29) 2,4-Dinitrotoluene	Micrograms/L	≤ 0.11 annual avg.	≤ 9.1 annual avg.	≤ 9.1 annual avg.	≤ 9.1 annual avg.		

(30) Dissolved Oxygen	Milligrams/L	See Rule 62-302.533, F.A.C.				Shall not average less than 4.0 in a 24-hour period and shall never be less than 3.0.	Shall not be less than 0.3, fifty percent of the time on an annual basis for flows greater than or equal to 250 cubic feet per second and shall never be less than 0.1. Normal daily and seasonal fluctuations above these levels shall be maintained.
(31) Dissolved Solids	Milligrams/L	≤ 500 as a monthly avg.; ≤ 1,000 max					
(32) Fluorides	Milligrams/L	≤ 1.5	≤ 1.5	≤ 10.0	≤ 5.0	≤ 10.0	≤ 10.0
(33) "Free Froms" (see Minimum Criteria in Section 62-302.500, F.A.C.)							
(34) "General Criteria" (see Section 62-302.500, F.A.C. and individual criteria)							
(35)(a) Halomethanes (Total trihalomethanes) (total of bromoform, chlorodibromo-methane, dichlorobromome-thane, and chloroform). Individual halomethanes shall not exceed (b)1. to (b)5. below.	Micrograms/L	≤ 80					
(35)(b)1. Halomethanes (individual): Bromoform	Micrograms/L	≤ 4.3 annual avg.	≤ 360 annual avg.	≤ 360 annual avg.	≤ 360 annual avg.		

(35)(b)2. Halomethanes (individual): Chlorodibromo-methane	Micrograms/L	≤ 0.41 annual avg.	≤ 34 annual avg.	≤ 34 annual avg.	≤ 34 annual avg.		
(35)(b)3. Halomethanes (individual): Chloroform	Micrograms/L	≤ 5.67 annual avg.	≤ 470.8 annual avg.	≤ 470.8 annual avg.	≤ 470.8 annual avg.		
(35)(b)4. Halomethanes (individual): Chloromethane (methyl chloride)	Micrograms/L	≤ 5.67 annual avg.	≤ 470.8 annual avg.	≤ 470.8 annual avg.	≤ 470.8 annual avg.		
(35)(b)5. Halomethanes (individual): Dichlorobromomethane	Micrograms/L	≤ 0.27 annual avg.	≤ 22 annual avg.	≤ 22 annual avg.	≤ 22 annual avg.		
(36) Hexachlorobutadiene	Micrograms/L	≤ 0.45 annual avg.	≤ 49.7 annual avg.	≤ 49.7 annual avg.	≤ 49.7 annual avg.		
(37) Imbalance (see Nutrients)							
(38) Iron	Milligrams/L	≤ 1.0	≤ 0.3	≤ 1.0	≤ 0.3	≤ 1.0	
(39) Lead	Micrograms/L See Notes (1) and (3).	$Pb \leq e^{(1.273[\ln H] - 4.705)}$;	≤ 8.5	$Pb \leq e^{(1.273 [\ln H] - 4.705)}$;	≤ 8.5	≤ 50	≤ 50
(40) Manganese	Milligrams/L		≤ 0.1				
(41) Mercury	Micrograms/L	≤0.012	≤0.025	≤0.012	≤0.025	≤ 0.2	≤ 0.2
(42) Minimum Criteria (see Section 62-302.500, F.A.C.)							
(43) Mixing Zones (See Section 62-4.244, F.A.C.)							
(44) Nickel	Micrograms/L See Notes (1) and (3).	$Ni \leq e^{(0.846[\ln H]+0.0584)}$	≤ 8.3	$Ni \leq e^{(0.846[\ln H]+0.0584)}$	≤ 8.3	≤ 100	
(45) Nitrate	Milligrams/L as N	≤ 10 or that concentration that exceeds the nutrient criteria					
(46) Nuisance Species		Substances in concentrations which result in the dominance of nuisance species: none shall be present.					

(47)(a) Nutrients		The discharge of nutrients shall continue to be limited as needed to prevent violations of other standards contained in this chapter. Man-induced nutrient enrichment (total nitrogen or total phosphorus) shall be considered degradation in relation to the provisions of Rules 62-302.300, 62-302.700, and 62-4.242, F.A.C.					
(47)(b) Nutrients		In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna.					
(48) Odor (also see Color, Minimum Criteria, Phenolic Compounds, etc.)	Threshold odor number		Shall not exceed 24 at 60 degrees C as a daily average.				Odor producing substances: only in such amounts as will not unreasonably interfere with use of the water for the designated purpose of this classification.
(49)(a) Oils and Greases	Milligrams/L	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 10.0
(49)(b) Oils and Greases		No undissolved oil, or visible oil defined as iridescence, shall be present so as to cause taste or odor, or otherwise interfere with the beneficial use of waters.					
(50) Pesticides and Herbicides							
(50)(a) 2,4,5-TP	Micrograms/L	$\leq$ 10					
(50)(b) 2-4-D	Micrograms/L	$\leq$ 100					
(50)(c) Aldrin	Micrograms/L	$\leq$ .00013 annual avg.; 3.0 max	$\leq$ .00014 annual avg.; 1.3 max	$\leq$ .00014 annual avg.; 3.0 max	$\leq$ .00014 annual avg.; 1.3 max		
(50)(d) Beta-hexachlorocyclohexane (b-BHC)	Micrograms/L	$\leq$ 0.014 annual avg.	$\leq$ 0.046 annual avg.	$\leq$ 0.046 annual avg.	$\leq$ 0.046 annual avg.		
(50)(e) Chlordane	Micrograms/L	$\leq$ 0.00058 annual avg.; 0.0043 max	$\leq$ 0.00059 annual avg.; 0.004 max	$\leq$ 0.00059 annual avg.; 0.0043 max	$\leq$ 0.00059 annual avg.; 0.004 max		
(50)(f) DDT	Micrograms/L	$\leq$ 0.00059 annual avg.; 0.001 max	$\leq$ 0.00059 annual avg.; 0.001 max	$\leq$ 0.00059 annual avg.; 0.001 max	$\leq$ 0.00059 annual avg.; 0.001 max		

(50)(g) Demeton	Micrograms/L	≤ 0.1	≤ 0.1	≤ 0.1	≤ 0.1		
(50)(h) Dieldrin	Micrograms/L	≤ 0.00014 annual avg.; 0.0019 max	≤ 0.00014 annual avg.; 0.0019 max	≤ 0.00014 annual avg.; 0.0019 max	≤ 0.00014 annual avg.; 0.0019 max		
(50)(i) Endosulfan	Micrograms/L	≤ 0.056	≤ 0.0087	≤ 0.056	≤ 0.0087		
(50)(j) Endrin	Micrograms/L	≤ 0.0023	≤ 0.0023	≤ 0.0023	≤ 0.0023		
(50)(k) Guthion	Micrograms/L	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01		
(50)(l) Heptachlor	Micrograms/L	≤ 0.00021 annual avg.; 0.0038 max	≤ 0.00021 annual avg.; 0.0036 max	≤ 0.00021 annual avg.; 0.0038 max	≤ 0.00021 annual avg.; 0.0036 max		
(50)(m) Lindane (g-benzene hexachloride)	Micrograms/L	See Minimum criteria in paragraph 62-302.500(1)(d), F.A.C.	See Minimum criteria in paragraph 62-302.500(1)(d), F.A.C.	See Minimum criteria in paragraph 62-302.500(1)(d), F.A.C.	See Minimum criteria in paragraph 62-302.500(1)(d), F.A.C.		
(50)(n) Malathion	Micrograms/L	≤ 0.1	≤ 0.1	≤ 0.1	≤ 0.1		
(50)(o) Methoxychlor	Micrograms/L	≤ 0.03	≤ 0.03	≤ 0.03	≤ 0.03		
(50)(p) Mirex	Micrograms/L	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001		
(50)(q) Parathion	Micrograms/L	≤ 0.04	≤ 0.04	≤ 0.04	≤ 0.04		
(50)(r) Toxaphene	Micrograms/L	≤ 0.0002	≤ 0.0002	≤ 0.0002	≤ 0.0002		
(51)(a) pH (Class I and Class IV Waters)	Standard Units	Shall not vary more than one unit above or below natural background provided that the pH is not lowered to less than 6 units or raised above 8.5 units. If natural background is less than 6 units, the pH shall not vary below natural background or vary more than one unit above natural background. If natural background is higher than 8.5 units, the pH shall not vary above natural background or vary more than one unit below background.					
(51)(b) pH (Class II Waters)	Standard Units	Shall not vary more than one unit above or below natural background of coastal waters as defined in paragraph 62-302.520(3)(b), F.A.C., or more than two-tenths unit above or below natural background of open waters as defined in paragraph 62-302.520(3)(f), F.A.C., provided that the pH is not lowered to less than 6.5 units or raised above 8.5 units. If natural background is less than 6.5 units, the pH shall not vary below natural background or vary more than one unit above natural background for coastal waters or more than two-tenths unit above natural background for open waters. If natural background is higher than 8.5 units, the pH shall not vary above natural background or vary more than one unit below natural background of coastal waters or more than two-tenths unit below natural background of open waters.					

(51)(c) pH (Class III Waters)	Standard Units	Shall not vary more than one unit above or below natural background of predominantly fresh waters and coastal waters as defined in paragraph 62-302.520(3)(b), F.A.C. or more than two-tenths unit above or below natural background of open waters as defined in paragraph 62-302.520(3)(f), F.A.C., provided that the pH is not lowered to less than 6 units in predominantly fresh waters, or less than 6.5 units in predominantly marine waters, or raised above 8.5 units. If natural background is less than 6 units, in predominantly fresh waters or 6.5 units in predominantly marine waters, the pH shall not vary below natural background or vary more than one unit above natural background of predominantly fresh waters and coastal waters, or more than two-tenths unit above natural background of open waters. If natural background is higher than 8.5 units, the pH shall not vary above natural background or vary more than one unit below natural background of predominantly fresh waters and coastal waters, or more than two-tenths unit below natural background of open waters.					
(51)(d) pH (Class V Waters)	Standard Units	Not lower than 5.0 nor greater than 9.5 except certain swamp waters which may be as low as 4.5.					
(52)(a) Phenolic Compounds: Total		Phenolic compounds other than those produced by the natural decay of plant material, listed or unlisted, shall not taint the flesh of edible fish or shellfish or produce objectionable taste or odor in a drinking water supply.					
(52)(b) Total Chlorinated Phenols and Chlorinated Cresols	Micrograms/L	1. The total of all chlorinated phenols, and chlorinated cresols, except as set forth in (c)1. to (c)4. below, shall not exceed 1.0 unless higher values are shown not to be chronically toxic. Such higher values shall be approved in writing by the Secretary. 2. The compounds listed in (c)1. to (c)6. below shall not exceed the limits specified for each compound.					1. The total of the following Phenolic compounds shall not exceed 50: a) Chlorinated phenols; b) Chlorinated cresols; and c) 2,4-dinitrophenol.
(52)(c) 1. Phenolic Compound: 2-chlorophenol	Micrograms/L	$\leq$ 120	< 400 See Note (2).	< 400 See Note (2).	< 400 See Note (2).	< 400 See Note (2).	
(52)(c) 2. Phenolic Compound: 2,4-dichlorophenol	Micrograms/L	< 93 See Note (2).	< 790 See Note (2).	< 790 See Note (2).	< 790 See Note (2).	< 790 See Note (2).	
(52)(c) 3. Phenolic Compound: Pentachlorophenol	Micrograms/L	$\leq$ 30 max; $\leq$ 0.28 annual avg; $\leq e^{(1.005[pH]-5.29)}$	$\leq$ 7.9	$\leq$ 30 max; $\leq$ 8.2 annual avg; $\leq e^{(1.005[pH]-5.29)}$	$\leq$ 7.9	$\leq$ 30	
(52)(c) 4. Phenolic Compound: 2,4,6-trichlorophenol	Micrograms/L	$\leq$ 2.1 annual avg.	$\leq$ 6.5 annual avg.	$\leq$ 6.5 annual avg.	$\leq$ 6.5 annual avg.	$\leq$ 6.5 annual avg.	

(52)(c) 5. Phenolic Compound: 2,4-dinitrophenol	Milligrams/L	≤ 0.0697 See Note (2).	≤ 14.26 See Note (2).	≤ 14.26 See Note (2).	≤ 14.26 See Note (2).	≤ 14.26 See Note (2).	
(52)(c) 6. Phenolic Compound: Phenol	Milligrams/L	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3
(53) Phosphorus (Elemental)	Micrograms/L		≤ 0.1		≤ 0.1		
(54) Phthalate Esters	Micrograms/L	≤ 3.0		≤ 3.0			
(55) Polychlorinated Biphenyls (PCBs)	Micrograms/L	≤ 0.000044 annual avg.; 0.014 max	≤ 0.000045 annual avg.; 0.03 max	≤ 0.000045 annual avg.; 0.014 max	≤ 0.000045 annual avg.; 0.03 max		
(56)(a) Polycyclic Aromatic Hydrocarbons (PAHs). Total of: Acenaphthylene; Benzo(a)anthracene; Benzo(a)pyrene; Benzo(b)fluoran-thene; Benzo-(ghi)perylene; Benzo(k)fluoranthene; Chrysene; Dibenzo-(a,h)anthracene; Indeno(1,2,3-cd)pyrene; and Phenanthrene	Micrograms/L	≤ 0.0028 annual avg.	≤ 0.031 annual avg.	≤ 0.031annual avg.	≤ 0.031 annual avg.		
(56)(b)1. (Individual PAHs): Acenaphthene	Milligrams/L	< 1.2 See Note (2).	< 2.7 See Note (2).	< 2.7 See Note (2).	< 2.7 See Note (2).		
(56)(b)2. (Individual PAHs): Anthracene	Milligrams/L	< 9.6 See Note (2).	< 110 See Note (2).	< 110 See Note (2).	< 110 See Note (2).		
(56)(b)3. (Individual PAHs): Fluoranthene	Milligrams/L	< 0.3 See Note (2).	< 0.370 See Note (2).	< 0.370 See Note (2).	< 0.370 See Note (2).		
(56)(b)4. (Individual PAHs): Fluorene	Milligrams/L	< 1.3 See Note (2).	< 14 See Note (2).	< 14 See Note (2).	< 14 See Note (2).		
(56)(b)5. (Individual PAHs): Pyrene	Milligrams/L	< 0.96 See Note (2).	< 11 See Note (2).	< 11 See Note (2).	< 11 See Note (2).		
(57)(a) Radioactive substances (Combined radium 226 and 228)	Picocuries/L	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5	≤ 5

(57)(b) Radioactive substances (Gross alpha particle activity including radium 226, but excluding radon and uranium)	Picocuries/L	≤ 15	≤ 15	≤ 15	≤ 15	≤ 15	≤ 15
(58) Selenium	Micrograms/L	≤ 5.0	≤ 71	≤ 5.0	≤ 71		
(59) Silver	Micrograms/L See Note (3).	≤ 0.07	See Minimum criteria in Section 62-302.500(1)(c)	≤ 0.07	See Minimum criteria in Section 62-302.500(1)(c)		
(60) Specific Conductance (see Conductance, Specific, above)							
(61) Substances in concentrations which injure, are chronically toxic to, or produce adverse physiological or behavioral response in humans, plants, or animals		None shall be present.					
(62) 1,1,2,2-Tetrachloroethane	Micrograms/L	≤ 0.17 annual avg.	≤ 10.8 annual avg.	≤ 10.8 annual avg.	≤ 10.8 annual avg.		
(63) Tetrachloroethylene (1,1,2,2-tetrachloroethene)	Micrograms/L	≤ 0.8 annual avg., ≤ 3.0 max	≤ 8.85 annual avg.	≤ 8.85 annual avg.	≤ 8.85 annual avg.		
(64) Thallium	Micrograms/L	< 1.7	< 6.3	< 6.3	< 6.3		
(65) Thermal Criteria (See Rule 62-302.520)							
(66) Total Dissolved Gases	Percent of the saturation value for gases at the existing atmospheric and hydrostatic pressures	≤ 110% of saturation value	≤ 110% of saturation value	≤ 110% of saturation value	≤ 110% of saturation value		

(67) Transparency	Depth of the compensation point within the water column for photosynthetic activity	The annual average value shall not be reduced by more than 10% as compared to the natural background value. Annual average values shall be based on a minimum of three samples, with each sample collected at least three months apart.	The annual average value shall not be reduced by more than 10% as compared to the natural background value. Annual average values shall be based on a minimum of three samples, with each sample collected at least three months apart.	The annual average value shall not be reduced by more than 10% as compared to the natural background value. Annual average values shall be based on a minimum of three samples, with each sample collected at least three months apart.	The annual average value shall not be reduced by more than 10% as compared to the natural background value. Annual average values shall be based on a minimum of three samples, with each sample collected at least three months apart.		
(68) Trichloroethylene (trichloroethene)	Micrograms/L	≤ 2.7 annual avg., ≤ 3.0 max	≤ 80.7 annual avg.	≤ 80.7 annual avg.	≤ 80.7 annual avg.		
(69) Turbidity	Nephelometric Turbidity Units (NTU)	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions
(70) Zinc	Micrograms/L See Notes (1) and (3).	Zn ≤ $e^{(0.8473[lnH]+0.884)}$	≤ 86	Zn ≤ $e^{(0.8473[lnH]+0.884)}$	≤ 86	≤ 1,000	≤ 1,000

Notes: (1) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L. (2) This criterion is protective of human health not of aquatic life. (3) For application of dissolved metals criteria see Rule 62-302.500(2)(d), F.A.C. (4) Class III Limited waters have at least one Site Specific Alternative Criterion as established under Rule 62-302.800, F.A.C.

Rulemaking Authority 403.061, 403.062, 403.087, 403.504, 403.704, 403.804 FS. Law Implemented 403.021(11), 403.061, 403.087, 403.088, 403.141, 403.161, 403.182, 403.502, 403.702, 403.708 FS. History–New 1-28-90, Formerly 17-3.065, Amended 2-13-92, 6-17-92, Formerly 17-302.540, 17-302.550, 17-302.560, 17-302.570, 17-302.580, Amended 4-25-93, Formerly 17-302.530, Amended 1-23-95, 1-15-96, 5-15-02, 7-19-04, 12-7-06, 8-5-10, 7-3-12, 8-1-13.

X. APPENDIX A. TECHNICAL BASIS FOR SURFACE WATER QUALITY CRITERIA IN CHAPTER 62-302

The Class I, II, and III standards are derived using equations for either carcinogens or non-carcinogens as outlined by the U.S. EPA (1991). For carcinogens the inputs include a single allowable excess cancer risk level[1] of 1E-06. This risk level is the goal for Florida, however it should be noted that the ambient water quality criteria documents provided by the U.S. EPA list, for illustrative purposes, allowable risk levels from 1E-05 to 1E-07. Other standard default values in the equations are those commonly used by the U.S. EPA and States for risk assessment purposes.

Generally, for carcinogens the inputs include the chemical-specific slope factor (a toxicity value), an assumed adult body weight of 70 kg (154 lbs; approximate mean body weight for all adults, male and female), a drinking water consumption rate of 2 L/day (0.53 gal; upper-percentile value for adults), a fish consumption rate of 6.5 g/day (0.014 lbs; assumed to represent the average per capita consumption of freshwater/estuarine fish) and a bioconcentration factor for the chemical of concern.

For non-carcinogens, the same input values are used, except a reference dose (RfD) is utilized instead of a cancer slope factor and the target risk is a hazard index of 1, as specified in Section 376.81, F.S. The RfD is an estimate of the daily exposure that one can receive without appreciable risk of having adverse, non-cancer health effects during a lifetime, and a hazard index represents the ratio of an exposure level for a chemical to its RfD.

The following equations illustrate the calculation of SWQC for carcinogens and non-carcinogens.

For Carcinogens:[2]

$$\text{SWQC (mg/L)} = \frac{(\text{Allowable Risk Level} \times \text{Body Weight})}{\text{Slope Factor} \times [\text{Water Ingestion} + (\text{Fish Ingestion} \times \text{BCF})]}$$

[1] For regulatory purposes, cancer risk is typically calculated as an upper bound estimate of probability, e.g. 1E-06 might mean that there is 95% certainty that the actual cancer risk is one in one million or less.
[2] Class II and III waters are not designated for potable use, therefore drinking water consumption is not used in the equations when calculating standards for these waters.

For Non-Carcinogens: [2]

$$\text{SWQC (mg/L)} = \frac{(\text{Allowable Hazard Quotient} \times \text{RfD} \times \text{Body Weight})}{\text{Water Ingestion} + (\text{Fish Ingestion} \times \text{BCF})}$$

EXHIBIT

D

COMPARISON OF EXISTING FLORIDA HUMAN HEALTH WATER QUALITY CRITERIA WITH EPA RECOMMENDED HUMAN HEALTH WATER QUALITY CRITERIA* (Sept. 2015)

Chemical	Fish Consumption Rate (g/day)		Human Body Weight (kg)		Water Consumption Rate (L/day)		Cancer Risk Level		Cancer Slope Factor		Reference Dose		Fish Bio Factor			Relative Source Contribution		Water Quality Criterion (Consumption of Fish/Shellfish Only) (µg/L)		Water Quality Criterion (Consumption of Water/Fish/Shellfish) (µg/L)	
	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida BCF/BAF	EPA BCF	EPA BAF	Florida	EPA	Florida Class III Waters	EPA	Florida Class I Waters	EPA
Acenaphthene 83329	6.5	22	70	80	2.0	2.4					0.06	0.06	242	510		1.0	0.20	2700	90	1200	70
Acrolein 107028		22		80		2.4						0.0005			TL1=1.0 TL2=1.0 TL3=1.0		0.20		400		3
Acrylonitrile 107131	6.5	22	70	80	2.0	2.4	10-6	10-6	0.54	0.54			30		TL1=1.0 TL2=1.0 TL3=1.0				7.0		0.061
Aldrin 309002	6.5	22	70	80	2.0	2.4	10-6	10-6	0.00003	17		0.00003	4670		TL1=18000 TL2=310000 TL3=650000		0.20	0.00014	0.00000077	0.00013	0.00000077
alpha-Hexachlorocyclohexane (HCH) 319846		22		80		2.4		10-6		6.3		0.008			TL1=1700 TL2=1400 TL3=1500		0.20		0.00039		0.00036
alpha-Endosulfan 959988	6.5	22	70	80	2.0	2.4					0.006	0.006	270		TL1=130 TL2=180 TL3=200	1.0	0.20	0.056	30	0.056	20
Anthracene 120127	6.5	22	70	80	2.0	2.4					0.3	0.3	30	610		1.0	0.20	110,000	400	9,600	300
Antimony 7440360	6.5	17.5	70	70	2.0	2.0					0.0004	0.0004	0.5	1		0.4	0.40	4,300	640	14.0	5.6
Arsenic 7440382		6.5		70		2.0		10-6		1.75				44				50	0.14	10	0.018
Asbestos 1332214																					7 million fibers/L
Barium 7440393																				1,000	1,000
Benzene 71432	6.5	22	70	80	2.0	2.4	10-6	10-6	0.029	0.015 – 0.055		0.0005	5.2		TL1=3.6 TL2=4.5 TL3=5.0		0.20	71.28	16-58	1.18	0.58-2.1

Chemical	Fish Consumption Rate (g/day)		Human Body Weight (kg)		Water Consumption Rate (L/day)		Cancer Risk Level		Cancer Slope Factor		Reference Dose		Fish Bio Factor			Relative Source Contribution		Water Quality Criterion (Consumption of Fish/Shellfish Only) (µg/L)		Water Quality Criterion (Consumption of Water/Fish/Shellfish) (µg/L)	
	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida BCF/BAF	EPA BCF	EPA BAF	Florida	EPA	Florida Class III Waters	EPA	Florida Class I Waters	EPA
Benzidine 92875		22		80		2.4		10-6		230		0.003			TL1=1.4 TL2=1.6 TL3=1.7		0.20		0.011		0.00014
Benzo(a)anthracene 56553	PAH	22	PAH	80	PAH	2.4	PAH	10-6	PAH	0.73			PAH	3900				PAH	0.0013	PAH	0.0012
Benzo(a)pyrene 50328	PAH	22	PAH	80	PAH	2.4	10-6	10-6	PAH	7.3			PAH	3900				PAH	0.00013	PAH	0.00012
Benzo(b)fluoranthene 205992	PAH	22	PAH	80	PAH	2.4	PAH	10-6	PAH	0.73			PAH	3900				PAH	0.0013	PAH	0.0012
Benzo(k)fluoranthene 207089	PAH	22	PAH	80	PAH	2.4	PAH	10-6	PAH	0.73			PAH	3900				PAH	0.013	PAH	0.012
Beryllium 7440417	6.5		70		2.0		10-6		4.3				19					0.0077		0.13	
beta-Hexachlorocyclohexane (HCH) 319857	6.5	22	70	80	2.0	2.4	10-6	10-6	1.8	1.8			130		TL1=110 TL2=160 TL3=180			0.046	0.014	0.014	0.0080
beta-Endosulfan 33213659	6.5	22	70	80	2.0	2.4					0.006	0.006	270		TL1=80 TL2=110 TL3=130	1.0	0.20	0.056	40	0.056	20
Bis(2-Chloro-1-methylethyl) Ether 108601		22		80		2.4						0.04			TL1=6.7 TL2=8.8 TL3=10		0.20		4,000		200
Bis(2-Chloroethyl) Ether 111444		22		80		2.4		10-6		1.1					TL1=1.4 TL2=1.6 TL3=1.7				2.2		0.030
Bis(2-Ethylhexyl) Phthalate 117817		22		80		2.4		10-6		0.014		0.06		710			0.20		0.37		0.32
Bis(Chloromethyl) Ether 542881		22		80		2.4		10-6		220					TL1=1.0 TL2=1.0 TL3=1.0				0.017		0.00015
Bromoform 75252	6.5	22	70	80	2.0	2.4	10-6	10-6	0.0079	0.0045		0.03	3.75		TL1=5.8 TL2=7.5 TL3=8.5		0.20	360	120	4.3	7.0

Chemical	Fish Consumption Rate (g/day)		Human Body Weight (kg)		Water Consumption Rate (L/day)		Cancer Risk Level		Cancer Slope Factor		Reference Dose		Fish Bio Factor			Relative Source Contribution		Water Quality Criterion (Consumption of Fish/Shellfish Only) (µg/L)		Water Quality Criterion (Consumption of Water/Fish/Shellfish) (µg/L)	
	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida BCF/BAF	EPA BCF	EPA BAF	Florida	EPA	Florida Class III Waters	EPA	Florida Class I Waters	EPA
Butylbenzyl Phthalate 85687		22		80		2.4		10-6		0.0019		1.3		19000			0.20		0.10		0.10
Cadmium 7440439																					
Carbon Tetrachloride 56235	6.5	22	70	80	2.0	2.4	10-6	10-6	0.13	0.07		0.004	18.75		TL1=9.3 TL2=12 TL3=14		0.20	4.42	5	0.25	0.4
Chlordane 57749	6.5	22	70	80	2.0	2.4	10-6	10-6	1.3	0.35		0.0005	14100		TL1=5300 TL2=44000 TL3=60000		0.20	0.00059	0.00032	0.00058	0.00031
Chlorobenzene 108907		22		80		2.4						0.02			TL1=14 TL2=19 TL3=22		0.20		800		100
Chlorodibromomethane 124481	6.5	22	70	80	2.0	2.4	10-6	10-6	0.084	0.040		0.02	3.75		TL1=3.7 TL2=4.8 TL3=5.3		0.20		21		0.80
Chloroform 67663	6.5	22	70	80	2.0	2.4	10-6	10-6	0.0061			0.01	3.75		TL1=2.8 TL2=3.4 TL3=3.8		0.20	470.8	2,000	5.67	60
Chlorophenoxy Herbicide (2,4-D) 94757		22		80		2.4						0.21		13			0.20		1,300	100	12,000
Chlorophenoxy Herbicide (2,4,5-TP) [Silvex] 93721		22		80		2.4						0.008		58			0.80		400	10	100
Chromium (III) 16065831																					
Chromium (VI) 18540299																					
Chrysene 218019	PAH	22	PAH	80	PAH	2.4	PAH	10-6	PAH	0.0073			PAH	3900				PAH	0.13	PAH	0.12
Copper 7440508																					1,300

Chemical	Fish Consumption Rate (g/day)		Human Body Weight (kg)		Water Consumption Rate (L/day)		Cancer Risk Level		Cancer Slope Factor		Reference Dose		Fish Bio Factor			Relative Source Contribution		Water Quality Criterion (Consumption of Fish/Shellfish Only) (µg/L)		Water Quality Criterion (Consumption of Water/Fish/Shellfish) (µg/L)	
	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida BCF/BAF	EPA BCF	EPA BAF	Florida	EPA	Florida Class III Waters	EPA	Florida Class I Waters	EPA
Cyanide 57125		22		80		2.4						0.0006		1			0.20	5.2	400	5.2	4
Dibenzo(a,h)anthracene 53703	PAH	22	PAH	80	PAH	2.4	PAH	10-6	PAH	7.3	PAH		PAH	3900				PAH	0.00013	PAH	0.00012
Dichlorobromomethane 75274	6.5	22	70	80	2.0	2.4	10-6	10-6	0.062	0.034		0.003	3.75		TL1=3.4 TL2=4.3 TL3=4.8		0.20	22	27	0.27	0.95
Dieldrin 60571	6.5	22	70	80	2.0	2.4	10-6	10-6	16	16		0.00005	4670		TL1=14000 TL2=210000 TL3=410000		0.20	0.00014	0.0000012	0.00014	0.0000012
Diethyl Phthalate 84662		22		80		2.4						0.8		920			0.20		600		600
Dimethyl Phthalate 131113		22		80		2.4						10		4000			0.20		2,000		2,000
Di-n-Butyl Phthalate 84742		22		80		2.4						0.1		2900			0.20		30		20
Dinitrophenols 25550587		22		80		2.4						0.002		1.51			0.20		1,000		10
Endosulfan Sulfate 1031078		22		80		2.4						0.006			TL1=88 TL2=120 TL3=140		0.20		40		20
Endrin 72208		22		80		2.4						0.0003			TL1=4600 TL2=36000 TL3=46000		0.80	0.0023	0.03	0.0023	0.03
Endrin Aldehyde 7421934		22		80		2.4						0.0003			TL1=440 TL2=920 TL3=850		0.80		1		1
Ethylbenzene 100414		22		80		2.4						0.022			TL1=100 TL2=140 TL3=160		0.20		130		68
Fluoranthene 206440	6.5	22	70	80	2.0	2.4					0.04	0.04	1150	1500		1.0	0.20	0.370	20	0.3	20

Chemical	Fish Consumption Rate (g/day)		Human Body Weight (kg)		Water Consumption Rate (L/day)		Cancer Risk Level		Cancer Slope Factor		Reference Dose		Fish Bio Factor			Relative Source Contribution		Water Quality Criterion (Consumption of Fish/Shellfish Only) (µg/L)		Water Quality Criterion (Consumption of Water/Fish/Shellfish) (µg/L)	
	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida BCF/BAF	EPA BCF	EPA BAF	Florida	EPA	Florida Class III Waters	EPA	Florida Class I Waters	EPA
Fluorene 86737	6.5	22	70	80	2.0	2.4					0.04	0.04	86737		TL1=230 TL2=450 TL3=710	1.0	0.20	14	70	1.3	50
gamma-Hexachlorocyclohexane (HCH) [Lindane] 58899	6.5	22	70	80	2.0	2.4	10-6		1.3			0.0047	130		TL1=1200 TL2=2400 TL3=2500		0.50	0.95	4.4	0.95	4.2
Heptachlor 76448	6.5	22	70	80	2.0	2.4	10-6	10-6	4.5	4.1		0.0001	11200		TL1=12000 TL2=180000 TL3=330000		0.20	0.00021	0.0000059	0.00021	0.0000059
Heptachlor Epoxide 1024573		22		80		2.4		10-6		5.5		0.000013			TL1=4000 TL2=28000 TL3=35000		0.20		0.000032		0.000032
Hexachlorobenzene 118741		22		80		2.4		10-6		1.02		0.0008			TL1=18000 TL2=46000 TL3=90000		0.20		0.000079		0.000079
Hexachlorobutadiene 87683	6.5	22	70	80	2.0	2.4	10-6	10-6	0.078	0.04		0.0003	2.78		TL1=23000 TL2=2800 TL3=1100		0.20	49.7	0.01	0.45	0.01
Hexachlorocyclohexane (HCH) -Technical 608731		22		80		2.4		10-6		1.8					TL1=160 TL2=220 TL3=250				0.010		0.0066
Hexachlorocyclopentadiene 77474		22		80		2.4						0.006			TL1=620 TL2=1500 TL3=1300		0.20		4		4
Hexachloroethane 67721		22		80		2.4		10-6		0.04		0.0007			TL1=1200 TL2=280 TL3=600		0.20		0.1		0.1
Indeno(1,2,3-cd)pyrene 193395	PAH	22	PAH	80	PAH	2.4	PAH	10-6	PAH	0.73			PAH	3900				PAH	0.0013	PAH	0.0012
Isophorone 78591		22		80		2.4		10-6		0.00095		0.2			TL1=1.9 TL2=2.2 TL3=2.4		0.20		1,800		34
Manganese 7439965																			100		50
Methylmercury 22967926		17.5		70								0.0001 mg/kg-day					2.7 x 10-5 mg/kg-da		0.3 mg/kg		

Chemical	Fish Consumption Rate (g/day)		Human Body Weight (kg)		Water Consumption Rate (L/day)		Cancer Risk Level		Cancer Slope Factor		Reference Dose		Fish Bio Factor			Relative Source Contribution		Water Quality Criterion (Consumption of Fish/Shellfish Only) (µg/L)		Water Quality Criterion (Consumption of Water/Fish/Shellfish) (µg/L)	
	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida BCF/BAF	EPA BCF	EPA BAF	Florida	EPA	Florida Class III Waters	EPA	Florida Class I Waters	EPA
Methoxychlor 72435		22		80		2.4						0.00002			TL1=1400 TL2=4800 TL3=4400		0.80	0.03	0.02	0.03	0.02
Methyl Bromide 74839		22		80		2.4						0.02			TL1=1.2 TL2=1.3 TL3=1.4		0.20		10,000		100
Methylene Chloride 75092	6.5	22	70	80	2.0	2.4	10-6	10-6	0.0075	0.002		0.006	0.9		TL1=1.4 TL2=1.5 TL3=1.6		0.20	1,580	1,000	4.65	20
Nickel 7440020		6.5		70		2.0						0.02		47					4,600		610
Nitrates 14797558																					10,000
Nitrobenzene 98953		22		80		2.4						0.002			TL1=2.3 TL2=2.8 TL3=3.1		0.20		600		10
Nitrosamines				70				10-6		43.46									1.24		0.0008
Nitrosodibutylamine, N 924163		17.5		70		2.0		10-6		5.43				3.38					0.22		0.0063
Nitrosodiethylamine, N 55185																			1.24		0.0008
Nitrosopyrrolidine, N 930552		17.5		70		2.0		10-6		2.13				0.055					34		0.016
N-Nitrosodimethylamine 62759		17.5		70		2.0		10-6		51				0.026					3.0		0.00069
N-Nitrosodi-n-Propylamine 621647		17.5		70		2.0		10-6		7.0				1.13					0.51		0.0050
N-Nitrosodiphenylamine 86306		17.5		70		2.0		10-6		0.0049				136					6.0		3.3

Chemical	Fish Consumption Rate (g/day)		Human Body Weight (kg)		Water Consumption Rate (L/day)		Cancer Risk Level		Cancer Slope Factor		Reference Dose		Fish Bio Factor			Relative Source Contribution		Water Quality Criterion (Consumption of Fish/Shellfish Only) (µg/L)		Water Quality Criterion (Consumption of Water/Fish/Shellfish) (µg/L)	
	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida BCF/BAF	EPA BCF	EPA BAF	Florida	EPA	Florida Class III Waters	EPA	Florida Class I Waters	EPA
Pentachlorobenzene 608935		22		80		2.4						0.0008			TL1=3500 TL2=4500 TL3=10000		0.20		0.1		0.1
Pentachlorophenol 87865	6.5	22	70	80	2.0	2.4	10-6	10-6	0.12	0.4		0.005	11		TL1=44 TL2=290 TL3=520		0.20	8.2	0.04	0.28	0.03
Phenol 108952		22		80		2.4						0.6			TL1=1.5 TL2=1.7 TL3=1.9		0.20	300	300,000	300	4,000
Polychlorinated Biphenyls (PCBs) 1336363	6.5	17.5	70	70	2.0	2.0	10-6	10-6	7.7	2.0			31200	31200				0.000045	0.000064	0.000044	0.000064
Polycyclic Aromatic Hydrocarbons (PAHs), Total	6.5		70		2.0		10-6		11.7					30				0.031		0.0028	
Pyrene 129000	6.5	22	70	80	2.0	2.4					0.03	0.03	30	860		1.0	0.20	11000	30	960	20
Selenium 7782492	6.5	17.5	70	70	2.0	2.0					0.005	0.005	4.8	4.8		1.0		5.0	4,200	5.0	170
Tetrachloroethylene 127184	6.5	22	70	80	2.0	2.4	10-6	10-6	0.0398	0.0021		0.006	30.6		TL1=49 TL2=66 TL3=76		0.20	8.85	29	0.8	10
Thallium 7440280	6.5	17.5	70	70	2.0	2.0					0.000068	0.000068	116	116		0.2	0.20	6.3	0.47	1.7	0.24
Toluene 108883		22		80		2.4						0.0097			TL1=11 TL2=15 TL3=17		0.20		520		57
Toxaphene 8001352	6.5	22	70	80	2.0	2.4	10-6	10-6	1.1	1.1		0.00035	13100		TL1=1700 TL2=6600 TL3=6300		0.20	0.0002	0.00071	0.0002	0.00070
Trichloroethylene 79016	6.5	22	70	80	2.0	2.4	10-6	10-6	0.0126	0.05		0.0005	10.6		TL1=8.7 TL2=12 TL3=13		0.20	80.7	7	2.7	0.6
Vinyl Chloride 75014		22		80		2.4		10-6		1.5		0.003			TL1=1.4 TL2=1.6 TL3=1.7		0.20		1.6		0.022

Chemical	Fish Consumption Rate (g/day)		Human Body Weight (kg)		Water Consumption Rate (L/day)		Cancer Risk Level		Cancer Slope Factor		Reference Dose		Fish Bio Factor			Relative Source Contribution		Water Quality Criterion (Consumption of Fish/Shellfish Only) (µg/L)		Water Quality Criterion (Consumption of Water/Fish/Shellfish) (µg/L)	
	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida BCF/BAF	EPA BCF	EPA BAF	Florida	EPA	Florida Class III Waters	EPA	Florida Class I Waters	EPA
Zinc 7440666		17.5										0.3		47					26,000		7,400
1,1,1-Trichloroethane 71556		22		80		2.4						2			TL1=6.9 TL2=9.0 TL3=10		0.20		200,000		10,000
1,1,2,2-Tetrachloroethane 79345	6.5	22	70	80	2.0	2.4	10-6	10-6	0.2	0.2		0.02	5		TL1=5.7 TL2=7.4 TL3=8.4		0.20	10.8	3	0.17	0.2
1,1,2-Trichloroethane 79005		22		80		2.4		10-6		0.057		0.004			TL1=6.0 TL2=7.8 TL3=8.9		0.20		8.9		0.55
1,1-Dichloroethylene 75354	6.5	22	70	80	2.0	2.4	10-6		0.6		0.05	0.05	5.6		TL1=2.0 TL2=2.4 TL3=2.6	0.2	0.20	3.2	20,000	0.057	300
1,2,4,5-Tetrachlorobenzene 95943		22		80		2.4						0.0003			TL1=17000 TL2=2900 TL3=1500		0.20		0.03		0.03
1,2,4-Trichlorobenzene 120821		22		80		2.4		10-6		0.029		0.01			TL1=2800 TL2=1500 TL3=430		0.20		0.076		0.071
1,2-Dichlorobenzene 95501		22		80		2.4						0.3			TL1=52 TL2=71 TL3=82		0.20		3,000		1,000
1,2-Dichloroethane 107062		22		80		2.4		10-6		0.0033		0.078			TL1=1.6 TL2=1.8 TL3=1.9		0.20		650		9.9
1,2-Dichloropropane 78875		22		80		2.4		10-6		0.036		0.0893			TL1=2.9 TL2=3.5 TL3=3.9		0.20		31		0.90
1,2-Diphenylhydrazine 122667		22		80		2.4		10-6		0.8					TL1=18 TL2=24 TL3=27				0.2		0.03
Trans-1,2-Dichloroethylene 156605		22		80		2.4						0.02			TL1=3.3 TL2=4.2 TL3=4.7		0.20		4,000		100
1,3-Dichlorobenzene 541731		22		80		2.4						0.002			TL1=31 TL2=120 TL3=190		0.20		10		7

Chemical	Fish Consumption Rate (g/day)		Human Body Weight (kg)		Water Consumption Rate (L/day)		Cancer Risk Level		Cancer Slope Factor		Reference Dose		Fish Bio Factor			Relative Source Contribution		Water Quality Criterion (Consumption of Fish/Shellfish Only) (µg/L)		Water Quality Criterion (Consumption of Water/Fish/Shellfish) (µg/L)	
	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida BCF/BAF	EPA BCF	EPA BAF	Florida	EPA	Florida Class III Waters	EPA	Florida Class I Waters	EPA
1,3-Dichloropropene 542756		22		80		2.4		10-6		0.122		0.025			TL1=2.3 TL2=2.7 TL3=3.0		0.20		12		0.27
1,4-Dichlorobenzene 106467		22		80		2.4						0.07			TL1=28 TL2=66 TL3=84		0.20		900		300
2,3,7,8-TCDD (Dioxin) 1746016		6.5		70		2.0		10-6		156000				5000					5.1E-9		5.0E-9
2,4,5-Trichlorophenol 95954		22		80		2.4						0.1	150		TL1=100 TL2=140 TL3=160		0.20		600		300
2,4,6-Trichlorophenol 88062	6.5	22	70	80	2.0	2.4	10-6	10-6	0.011	0.011		0.001			TL1=94 TL2=130 TL3=150		0.20	6.5	2.8	2.1	1.5
2,4-Dichlorophenol 120832	6.5	22	70	80	2.0	2.4					0.003	0.003	40.7		TL1=31 TL2=42 TL3=48	1.0	0.20	790	60	93	10
2,4-Dimethylphenol 105679		22		80		2.4						0.02			TL1=4.8 TL2=6.2 TL3=7.0		0.20		3,000		100
2,4-Dinitrophenol 51285	6.5	22	70	80	2.0	2.4					0.002	0.002	1.5	4.4		1.0	0.20	14260	300	69.7	10
2,4-Dinitrotoluene 121142	6.5	22	70	80	2.0	2.4	10-6	10-6	0.311	0.667		0.002	3.8		TL1=2.8 TL2=3.5 TL3=3.9		0.20	9.1	1.7	0.11	0.049
2-Chloronaphthalene 91587		22		80		2.4						0.08			TL1=150 TL2=210 TL3=240		0.80		1,000		800
2-Chlorophenol 95578	6.5	22	70	80	2.0	2.4					0.005	0.005	134		TL1=3.8 TL2=4.8 TL3=5.4	1.0	0.20	400	800	120	30
2-Methyl-4,6-Dinitrophenol 534521		22		80		2.4						0.0003			TL1=6.8 TL2=8.9 TL3=10		0.20		30		2

Chemical	Fish Consumption Rate (g/day)		Human Body Weight (kg)		Water Consumption Rate (L/day)		Cancer Risk Level		Cancer Slope Factor		Reference Dose		Fish Bio Factor			Relative Source Contribution		Water Quality Criterion (Consumption of Fish/Shellfish Only) (µg/L)		Water Quality Criterion (Consumption of Water/Fish/Shellfish) (µg/L)	
	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida	EPA	Florida BCF/BAF	EPA BCF	EPA BAF	Florida	EPA	Florida Class III Waters	EPA	Florida Class I Waters	EPA
3,3'-Dichlorobenzidine 91941	6.5	22	70	80	2.0	2.4	10-6	10-6	0.45	0.45			312		TL1=44 TL2=60 TL3=69				0.15		0.049
3-Methyl-4-Chlorophenol 59507		22		80		2.4						0.1			TL1=25 TL2=34 TL3=39		0.20		2,000		500
p,p'-Dichlorodiphenyldichloroethane (DDD) 72548		22		80		2.4		10-6		0.24		0.0005			TL1=33000 TL2=140000 TL3=240000		0.20		0.00012		0.00012
p,p'-Dichlorodiphenyldichloroethylene (DDE) 72559		22		80		2.4		10-6		0.167		0.0005			TL1=270000 TL2=1100000 TL3=3100000		0.20		0.000018		0.000018
p,p'-Dichlorodiphenyltrichloroethane (DDT) 50293	6.5	22	70	80	2.0	2.4	10-6	10-6	0.34	0.34		0.0005	53600		TL1=35000 TL2=240000 TL3=1100000		0.20	0.00059	0.000030	0.00059	0.000030

* Highlighted cells indicate that Florida factor or criterion is less stringent than the EPA recommended factor or criterion.

Table 9b. UFCR estimates (g/day raw weight, edible portion): Freshwater + estuarine fish, adults, 21 years and older, by geographic area

Freshwater + Estuarine Finfish and Shellfish	Percentiles (95% CI)					
	50th	75th	90th	95th	97th	99th
Adults (≥21 yrs)	5.0 (4.1,6.0)	11.4 (9.9,13.1)	22.0 (19.1,25.4)	31.8 (26.9,37.6)	40.2 (33.3,48.5)	61.1 (48.7,76.6)
Region[1]						
Northeast	5.8 (4.4,7.6)	12.6 (9.9,16.0)	23.1 (18.3,29.2)	32.3 (25.4,41.0)	39.9 (31.0,51.5)	58.5 (44.2,77.5)
Midwest	3.2 (2.5,4.2)	7.4 (6.0,9.0)	14.3 (11.8,17.4)	20.8 (16.9,25.7)	26.3 (21.0,33.0)	41.1 (31.3,54.0)
South	6.4 (4.7,8.5)	14.0 (11.3,17.4)	26.3 (21.6,32.0)	37.5 (30.5,46.1)	46.7 (37.6,58.1)	69.0 (54.3,87.7)
West	5.1 (3.9,6.6)	11.4 (8.8,14.8)	22.4 (16.8,29.8)	32.7 (23.9,44.9)	42.0 (30.0,58.8)	66.9 (45.4,98.5)
Coastal Status[2]						
Noncoastal	4.2 (3.4,5.2)	9.8 (8.2,11.6)	19.0 (15.8,22.9)	27.4 (22.3,33.8)	34.6 (27.7,43.3)	52.8 (40.7,68.4)
Coastal	6.6 (5.1,8.4)	14.4 (11.8,17.5)	27.1 (22.4,32.8)	38.6 (31.4,47.6)	48.4 (38.6,60.6)	72.7 (55.6,95.0)
Coastal/Inland Region[1,2]						
Pacific	6.3 (4.4,9.0)	14.0 (10.1,19.5)	27.3 (19.3,38.6)	39.7 (27.4,57.7)	51.2 (34.3,76.3)	81.2 (51.6,127.8)
Atlantic	8.3 (6.4,10.7)	17.0 (13.9,20.8)	30.8 (25.3,37.5)	42.8 (34.5,53.0)	52.3 (41.8,65.5)	75.8 (58.8,97.7)
Gulf of Mexico	7.3 (4.8,11.1)	15.7 (11.7,21.1)	28.6 (22.5,36.4)	40.1 (31.8,50.6)	50.3 (39.3,64.4)	73.8 (55.6,97.8)
Great Lakes	4.0 (3.1,5.1)	8.7 (7.1,10.7)	16.5 (13.5,20.2)	23.6 (19.1,29.1)	29.4 (23.5,36.8)	44.5 (34.1,57.9)
Inland Northeast	5.0 (3.5,7.3)	11.3 (8.0,16.0)	21.0 (14.8,29.7)	29.5 (20.6,42.2)	36.5 (25.3,52.8)	54.4 (36.7,80.6)
Inland Midwest	3.0 (2.3,4.0)	6.9 (5.5,8.7)	13.5 (10.8,17.0)	19.8 (15.5,25.2)	25.1 (19.4,32.6)	39.5 (29.1,53.5)
Inland South	5.3 (4.0,7.1)	12.0 (9.7,14.9)	22.8 (18.6,27.9)	32.7 (26.2,40.7)	40.9 (32.3,51.7)	61.0 (46.7,79.7)
Inland West	4.3 (3.3,5.4)	9.4 (7.4,12.1)	18.2 (13.7,24.3)	26.3 (19.1,36.1)	33.3 (23.8,46.7)	51.6 (35.5,74.9)

[1] U.S. regions are the U.S. Census Bureau regions. Midwest = OH, MI, IN, WI, IL, MO, IA, MN, SD, ND, NE, KS. Northeast = PA, NY, NJ, CT, RI, MA, NH, VT, ME. South = DE, MD, DC, VA, WV, KY, TN, NC, SC, GA, AL, MS, FL, LA, AR, OK, TX. West = NM, CO, WY, MT, ID, UT, AZ, NV, CA, OR, WA, AK, HI.

[2] Coastal regions include counties bordering the 3 coasts (Pacific, Atlantic, and Gulf of Mexico) and the Great Lakes and estuaries and bays. Additionally, any county that did not directly border a coast, but the central point was within 25 miles of a coast was defined as coastal. The inland regions are the remaining counties in each of the 4 Census Regions.

Source: Estimated Fish Consumption Rates for the U.S. Population and Selected Subpopulations (NHANES 2003-2010) (EPA-820-R-14-002, April 2014)

United States Environmental Protection Agency

EPA 820-F-15-001
June 2015

Human Health Ambient Water Quality Criteria: 2015 Update

Summary

EPA published final updated ambient water quality criteria for the protection of human health for 94 chemical pollutants. These updated recommendations reflect the latest scientific information and EPA policies, including updated body weight, drinking water consumption rate, fish consumption rate, bioaccumulation factors, health toxicity values, and relative source contributions. EPA accepted written scientific views from the public from May to August 2014 on the draft updated human health criteria and has published responses to those comments. EPA water quality criteria serve as recommendations to states and tribes authorized to establish water quality standards under the Clean Water Act.

Background

Ambient water quality criteria developed by EPA under Clean Water Act section 304(a) represent specific levels of chemicals or conditions in a water body that are not expected to cause adverse effects to human health. EPA is required to develop and publish water quality criteria that reflect the latest scientific knowledge. These criteria are not rules, nor do they automatically become part of a state's water quality standards. States may adopt the criteria that EPA publishes, modify EPA's criteria to reflect site-specific conditions, or adopt different criteria based on other scientifically-defensible methods. EPA must, however, approve any new water quality standards adopted by a state before they can be used for Clean Water Act purposes.

In this 2015 update, EPA revised 94 of the existing human health criteria to reflect the latest scientific information, including updated exposure factors (body weight, drinking water consumption rates, fish consumption rate), bioaccumulation factors, and toxicity factors (reference dose, cancer slope factor). The criteria have also been updated to follow the current EPA methodology for deriving human health criteria (USEPA 2000). EPA also developed chemical-specific science documents for each of the 94 chemical pollutants. The science documents detail the latest scientific information supporting the updated final human health criteria, particularly the updated toxicity and exposure input values. Specific updates are described below.

Due to outstanding technical issues, EPA did not update human health criteria for the following chemical pollutants at this time: antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium (III or VI), copper, manganese, methylmercury, nickel, nitrates, nitrosamines, N-nitrosodibutylamine, N-nitrosodiethylamine, N-nitrosopyrrolidine, N-nitrosodimethylamine, N-nitrosodi-n-propylamine, N-nitrosodiphenylamine, polychlorinated biphenyls (PCBs), selenium, thallium, zinc, or 2,3,7,8-TCDD (dioxin).

It is important for states and authorized tribes to consider any new or updated section 304(a) criteria as part of their triennial review to ensure that state or tribal water quality standards reflect current science and protect applicable designated uses. EPA recently proposed revisions to its water quality

standards regulations that would, if finalized without substantive change, require states during their triennial reviews to consider new or updated section 304(a) recommended criteria and, if they do not adopt new or revised criteria for such pollutants, provide an explanation to EPA as to why the state did not do so. These final updated human health criteria recommendations supersede EPA's previous recommendations.

Updated Exposure Inputs

Body Weight

EPA updated the default body weight for human health criteria to 80 kilograms based on National Health and Nutrition Examination Survey (NHANES) data from 1999 to 2006 (USEPA 2011). This represents the mean body weight for adults ages 21 and older. EPA's previously recommended default body weight was 70 kilograms, which was based on the mean body weight of adults from the NHANES III database (1988-1994).

Drinking Water

EPA updated the default drinking water consumption rate to 2.4 liters per day based on NHANES data from 2003 to 2006 (USEPA 2011). This represents the per capita estimate of community water ingestion at the 90th percentile for adults ages 21 and older. EPA previously recommended a default drinking water consumption rate of 2 liters per day, which represented the per capita community water ingestion rate at the 86th percentile for adults surveyed in the US Department of Agriculture's 1994-1996 Continuing Survey of Food Intake by Individuals (CSFII) analysis and the 88th percentile of adults in the National Cancer Institute study of the 1977-1978 Nationwide Food Consumption Survey.

Fish Consumption

EPA updated the default fish consumption rate to 22 grams per day. This rate represents the 90th percentile consumption rate of fish and shellfish from inland and nearshore waters for the U.S. adult population 21 years of age and older, based on NHANES data from 2003 to 2010 (USEPA 2014). EPA's previously recommended rate of 17.5 grams per day was based on the 90th percentile consumption rate of fish and shellfish from inland and nearshore waters for the U.S. adult population and was derived from 1994-1996 CSFII data.

As described in EPA's human health criteria methodology (USEPA 2000), the level of fish consumption in highly exposed populations varies by geographical location. Therefore, EPA suggests a four preference hierarchy for states and authorized tribes that encourages use of the best local, state, or regional data available to derive fish consumption rates. EPA recommends that states and authorized tribes consider developing criteria to protect highly exposed population groups and use local or regional data in place of a default value as more representative of their target population group(s). The preferred hierarchy is: (1) use of local data; (2) use of data reflecting similar geography/ population groups; (3) use of data from national surveys; and (4) use of EPA's default consumption rates.

Bioaccumulation Factors

EPA's methodology for deriving human health criteria emphasizes using, when possible, measured or estimated bioaccumulation factors (BAFs), which account for chemical accumulation in aquatic organisms from all potential exposure routes (USEPA 2000). Unlike bioconcentration factors, BAFs account for more exposure pathways than direct water contact. As a result, the updated criteria will better represent exposures to pollutants that affect human health. In order to account for the variation in bioaccumulation that is due to trophic position of the organism, EPA's methodology (USEPA 2000) recommends that BAFs be determined and applied to three trophic levels of fish.

EPA selected BAFs using a framework for deriving national trophic level-specific BAFs (USEPA 2000; USEPA 2003). EPA used field-measured BAFs and laboratory-measured bioconcentration factors available from peer-reviewed, publicly available databases to develop national BAFs. If this information was not available, EPA selected octanol-water partition coefficients (Kow values) from peer-reviewed sources for use in calculating national BAFs. As an additional line of evidence, EPA reported model-estimated BAFs for every chemical based on

the Estimation Program Interface (EPI) Suite (USEPA 2012) to support the field-measured or predicted BAFs.

Updated Health Toxicity Values

EPA considered all available toxicity values for both noncarcinogenic and carcinogenic toxicological effects to develop the updated human health criteria. EPA's Integrated Risk Information System (IRIS) was the primary source for reference dose and cancer slope factors for this update. For some pollutants, however, more recent toxicity assessments were provided by EPA's Office of Water, EPA's Office of Pesticide Programs, and international or state agencies. EPA followed a systematic process to search for and select the toxicity values used to derive the final updated human health criteria for noncarcinogenic and carcinogenic effects.

Relative Source Contribution

EPA updated the human health criteria to reflect chemical-specific relative source contributions (RSC) ranging from 20 to 80 percent following the Exposure Decision Tree approach described in EPA's methodology (USEPA 2000). EPA recommends inclusion of an RSC when developing human health criteria for threshold non-carcinogens or non-linear carcinogens. The RSC allows a percentage of the reference dose's exposure to be attributed to ambient water and fish consumption (including fish and shellfish from inland and nearshore waters) when there are other potential exposure sources. The rationale for this approach is that the objective of the water quality criteria is to ensure that an individual's total exposure from all sources does not exceed the criteria. Exposures outside of the RSC include, but are not limited to, exposure to a particular pollutant from ocean fish consumption (not included in the fish consumption rate), non-fish food consumption (meats, poultry, fruits, vegetables, and grains), dermal exposure, and respiratory exposure.

Where can I find more information?

To access the Federal Register notice, the final updated criteria, and supporting documents visit EPA's National Recommended Human Health Criteria website at: http://water.epa.gov/scitech/swguidance/standards/criteria/health/.

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Table 10 Distribution Parameters for Fish Consumption Rates													
			Distribution Parameters						Distribution Percentiles Consumers and Non-consumers [a] (g/day)				
			Consumers (log-transformed data)‡		Consumers and Non-consumers [a] (g/day)								
Population	**Group**	**Fraction Non Consumers**	**μ**	**σ**	**Mean**	**Standard Deviation**	**Min**	**Max [b]**	**50th**	**90th**	**95th**	**99th**	**99.9th**
All Adults	All	0.06	3.598	0.794	47.05	47.043	0.0	1259.6	34.25	98.25	131.6	227.1	417.8
All Adults	Florida	0.06	3.1	0.842	29.78	31.998	0.0	932.0	20.74	63.47	86.60	154.4	292.2
All Adults	Florida Landings Adjusted	0.06	2.705	0.824	19.74	20.622	0.0	624.7	14.00	41.79	56.55	99.45	187.1
Black Adults	All	0.06	3.441	0.977	47.37	63.096	0.0	2680.1	28.89	105.6	151.7	296.6	631.5
Black Adults	Florida	0.06	3.16	0.958	35.06	45.339	0.0	1682.6	21.84	77.70	110.7	214.2	451.4
Black Adults	Florida Landings Adjusted	0.06	2.84	0.864	23.34	26.041	0.0	766.9	15.98	50.15	69.15	125.1	243.5
Asian Adults	All	0.06	3.727	0.89	58.09	67.253	0.0	2051.8	38.71	126.1	175.2	322.0	638.4
Asian Adults	Florida	0.06	3.065	0.952	31.61	40.156	0.0	1417	19.82	70.02	99.55	191.4	395.6
Asian Adults	Florida Landings Adjusted	0.06	2.125	1.287	18.01	38.992	0.0	3070.6	7.559	41.53	66.88	162.3	441.8

‡ Distribution parameters for consumers of fish were calculated from the Survey data using a resampling methodology explained in detail in the main text.

[a] Distribution parameters and percentiles are computed assuming a population consisting of consumers and non-consumers of seafood. [b] Note that the maximum estimate is very susceptible to random variation and hence should not be used in the analysis.

Source: Final Baseline Risk Analysis for Chapter 62-302, F.A.C. (FDEP, May 2008)

Table E-96. Fish consumption, per capita, by state and habitat (uncooked g/day)

State	Habitat	SampN	PopN/ 1000	Pop Arith Mean	Pop Geom Mean	Percent Eating Fish	Pop Min	Pop Q5	Pop Q10	Pop Q25	Pop Q50	Pop Q75	Pop Q90	Pop Q95	Pop Q99	Max
CT	Freshwater	431	3388	1.2	.	36.3	0.00	0	0	0	0	1	3	6	15	41
	Estuarine	431	3388	10.2	.	75.3	0.00	0	0	0	3	10	22	35	99	347
	Marine	431	3388	24.7	.	84.0	0.00	0	0	4	14	31	60	79	186	365
	All	431	3388	36.1	.	84.2	0.00	0	0	7	21	46	90	113	227	651
FL	Freshwater	17181	15952	3.2	.	9.0	0.00	0	0	0	0	0	0	22	69	577
	Estuarine	17181	15952	8.3	.	26.0	0.00	0	0	0	0	4	28	46	108	1543
	Marine	17181	15952	22.5	.	39.5	0.00	0	0	0	0	27	59	97	220	2605
	All	17181	15952	34.1	.	49.6	0.00	0	0	0	0	43	89	137	288	2605
MN	Freshwater	841	4900	8.5	.	60.6	0.00	0	0	0	2	8	19	25	94	528
	Estuarine	841	4900	1.6	.	67.5	0.00	0	0	0	1	2	3	6	19	32
	Marine	841	4900	14.0	.	89.8	0.00	0	0	3	8	16	37	54	100	181
	All	841	4900	24.1	.	94.4	0.00	0	2	6	15	26	52	73	138	651
ND	Freshwater	602	639	8.2	.	68.7	0.00	0	0	0	3	9	20	36	62	170
	Estuarine	602	639	1.5	.	70.6	0.00	0	0	0	1	2	3	8	12	42
	Marine	602	639	15.6	.	89.3	0.00	0	0	3	7	17	33	63	126	229
	All	602	639	25.3	.	94.9	0.00	0	2	7	15	30	59	86	163	320

FL consumption is based on a 7-day recall, CT, MN, ND consumtpion is based on rate of consumption.
FL consumption excludes away-from-home consumption by children < 18.
Statistics are weighted to represent the general population in the states.
A respondent can be represented in more than one row.

Source: Fish Consumption in Connecticut, Florida, Minnesota, and North Dakota (EPA/600/R-13/098F, August 2013)

EXHIBIT

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Chemical-specific Inputs for the 2015 Final Updated Human Health Ambient Water Quality Criteria
June 2015

Chemical Name	CAS	Cancer Slope Factor, CSF (per mg/kg-d)	Reference Dose, RfD (mg/kg-d)	Relative Source Contribution, RSC (-)	Bioaccumulation Factor			Bioconcen-tration Factor (L/kg tissue)
					Trophic Level 2 (L/kg tissue)	Trophic Level 3 (L/kg tissue)	Trophic Level 4 (L/kg tissue)	
1,1,1-Trichloroethane	71-55-6	ND	2	0.20	6.9	9.0	10	ND
1,1,2,2-Tetrachloroethane	79-34-5	0.2	0.02	0.20	5.7	7.4	8.4	ND
1,1,2-Trichloroethane	79-00-5	0.057	0.004	0.20	6.0	7.8	8.9	ND
1,1-Dichloroethylene	75-35-4	ND	0.05	0.20	2.0	2.4	2.6	ND
1,2,4,5-Tetrachlorobenzene	95-94-3	ND	0.0003	0.20	17,000	2,900	1,500	ND
1,2,4-Trichlorobenzene	120-82-1	0.029	0.01	0.20	2,800	1,500	430	ND
1,2-Dichlorobenzene	95-50-1	ND	0.3	0.20	52	71	82	ND
1,2-Dichloroethane	107-06-2	0.0033	0.078	0.20	1.6	1.8	1.9	ND
1,2-Dichloropropane	78-87-5	0.036	0.0893	0.20	2.9	3.5	3.9	ND
1,2-Diphenylhydrazine	122-66-7	0.8	ND	ND	18	24	27	ND
1,3-Dichlorobenzene	541-73-1	ND	0.002	0.20	31	120	190	ND
1,3-Dichloropropene	542-75-6	0.122	0.025	0.20	2.3	2.7	3.0	ND
1,4-Dichlorobenzene	106-46-7	ND	0.07	0.20	28	66	84	ND
2,4,5-Trichlorophenol	95-95-4	ND	0.1	0.20	100	140	160	ND
2,4,6-Trichlorophenol	88-06-2	0.011	0.001	0.20	94	130	150	ND
2,4-Dichlorophenol	120-83-2	ND	0.003	0.20	31	42	48	ND
2,4-Dimethylphenol	105-67-9	ND	0.02	0.20	4.8	6.2	7.0	ND
2,4-Dinitrophenol	51-28-5	ND	0.002	0.20	ND	ND	ND	4.4
2,4-Dinitrotoluene	121-14-2	0.667	0.002	0.20	2.8	3.5	3.9	ND
2-Chloronaphthalene	91-58-7	ND	0.08	0.80	150	210	240	ND
2-Chlorophenol	95-57-8	ND	0.005	0.20	3.8	4.8	5.4	ND
2-Methyl-4,6-Dinitrophenol	534-52-1	ND	0.0003	0.20	6.8	8.9	10	ND
3,3'-Dichlorobenzidine	91-94-1	0.45	ND	ND	44	60	69	ND
3-Methyl-4-Chlorophenol	59-50-7	ND	0.1	0.20	25	34	39	ND
Acenaphthene	83-32-9	ND	0.06	0.20	ND	ND	ND	510
Acrolein	107-02-8	ND	0.0005	0.20	1.0	1.0	1.0	ND

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					Trophic Level 2 (L/kg tissue)	Trophic Level 3 (L/kg tissue)	Trophic Level 4 (L/kg tissue)	
Acrylonitrile	107-13-1	0.54	ND	ND	1.0	1.0	1.0	ND
Aldrin	309-00-2	17	0.00003	0.20	18,000	310,000	650,000	ND
alpha-Hexachlorocyclohexane (HCH)	319-84-6	6.3	0.008	0.20	1,700	1,400	1,500	ND
alpha-Endosulfan	959-98-8	ND	0.006	0.20	130	180	200	ND
Anthracene	120-12-7	ND	0.3	0.20	ND	ND	ND	610
Benzene	71-43-2	0.015 – 0.055	0.0005	0.20	3.6	4.5	5.0	ND
Benzidine	92-87-5	230	0.003	0.20	1.4	1.6	1.7	ND
Benzo(a)anthracene	56-55-3	0.73	ND	ND	ND	ND	ND	3,900
Benzo(a)pyrene	50-32-8	7.3	ND	ND	ND	ND	ND	3,900
Benzo(b)fluoranthene	205-99-2	0.73	ND	ND	ND	ND	ND	3,900
Benzo(k)fluoranthene	207-08-9	0.073	ND	ND	ND	ND	ND	3,900
beta-Hexachlorocyclohexane (HCH)	319-85-7	1.8	ND	ND	110	160	180	ND
beta-Endosulfan	33213-65-9	ND	0.006	0.20	80	110	130	ND
Bis(2-Chloro-1-Methylethyl) Ether	108-60-1	ND	0.04	0.20	6.7	8.8	10	ND
Bis(2-Chloroethyl) Ether	111-44-4	1.1	ND	ND	1.4	1.6	1.7	ND
Bis(2-Ethylhexyl) Phthalate	117-81-7	0.014	0.06	0.20	ND	ND	ND	710
Bis(Chloromethyl) Ether	542-88-1	220	ND	ND	1.0	1.0	1.0	ND
Bromoform	75-25-2	0.0045	0.03	0.20	5.8	7.5	8.5	ND
Butylbenzyl Phthalate	85-68-7	0.0019	1.3	0.20	ND	ND	ND	19,000
Carbon Tetrachloride	56-23-5	0.07	0.004	0.20	9.3	12	14	ND
Chlordane	57-74-9	0.35	0.0005	0.20	5,300	44,000	60,000	ND
Chlorobenzene	108-90-7	ND	0.02	0.20	14	19	22	ND
Chlorodibromomethane	124-48-1	0.040	0.02	0.20	3.7	4.8	5.3	ND
Chloroform	67-66-3	ND	0.01	0.20	2.8	3.4	3.8	ND

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					Trophic Level 2 (L/kg tissue)	Trophic Level 3 (L/kg tissue)	Trophic Level 4 (L/kg tissue)	
Chlorophenoxy Herbicide (2,4-D)	94-75-7	ND	0.21	0.20	ND	ND	ND	13
Chlorophenoxy Herbicide (2,4,5-TP) [Silvex]	93-72-1	ND	0.008	0.80	ND	ND	ND	58
Chrysene	218-01-9	0.0073	ND	ND	ND	ND	ND	3,900
Cyanide	57-12-5	ND	0.0006	0.20	ND	ND	ND	1
Dibenzo(a,h)anthracene	53-70-3	7.3	ND	ND	ND	ND	ND	3,900
Dichlorobromomethane	75-27-4	0.034	0.003	0.20	3.4	4.3	4.8	ND
Dieldrin	60-57-1	16	0.00005	0.20	14,000	210,000	410,000	ND
Diethyl Phthalate	84-66-2	ND	0.8	0.20	ND	ND	ND	920
Dimethyl Phthalate	131-11-3	ND	10	0.20	ND	ND	ND	4,000
Di-n-Butyl Phthalate	84-74-2	ND	0.1	0.20	ND	ND	ND	2,900
Dinitrophenols	25550-58-7	ND	0.002	0.20	ND	ND	ND	1.51
Endosulfan Sulfate	1031-07-8	ND	0.006	0.20	88	120	140	ND
Endrin	72-20-8	ND	0.0003	0.80	4,600	36,000	46,000	ND
Endrin Aldehyde	7421-93-4	ND	0.0003	0.80	440	920	850	ND
Ethylbenzene	100-41-4	ND	0.022	0.20	100	140	160	ND
Fluoranthene	206-44-0	ND	0.04	0.20	ND	ND	ND	1,500
Fluorene	86-73-7	ND	0.04	0.20	230	450	710	ND
gamma-Hexachlorocyclohexane (HCH)	58-89-9	ND	0.0047	0.50	1,200	2,400	2,500	ND
Heptachlor	76-44-8	4.1	0.0001	0.20	12,000	180,000	330,000	ND
Heptachlor Epoxide	1024-57-3	5.5	0.000013	0.20	4,000	28,000	35,000	ND
Hexachlorobenzene	118-74-1	1.02	0.0008	0.20	18,000	46,000	90,000	ND
Hexachlorobutadiene	87-68-3	0.04	0.0003	0.20	23,000	2,800	1,100	ND
Hexachlorocyclohexane (HCH)-Technical	608-73-1	1.8	ND	ND	160	220	250	ND
Hexachlorocyclopentadiene	77-47-4	ND	0.006	0.20	620	1,500	1,300	ND

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					Trophic Level 2 (L/kg tissue)	Trophic Level 3 (L/kg tissue)	Trophic Level 4 (L/kg tissue)	
Hexachloroethane	67-72-1	0.04	0.0007	0.20	1,200	280	600	ND
Indeno(1,2,3-cd)pyrene	193-39-5	0.73	ND	ND	ND	ND	ND	3,900
Isophorone	78-59-1	0.00095	0.2	0.20	1.9	2.2	2.4	ND
Methoxychlor	72-43-5	ND	0.00002	0.80	1,400	4,800	4,400	ND
Methyl Bromide	74-83-9	ND	0.02	0.20	1.2	1.3	1.4	ND
Methylene Chloride	75-09-2	0.002	0.006	0.20	1.4	1.5	1.6	ND
Nitrobenzene	98-95-3	ND	0.002	0.20	2.3	2.8	3.1	ND
Pentachlorobenzene	608-93-5	ND	0.0008	0.20	3,500	4,500	10,000	ND
Pentachlorophenol	87-86-5	0.4	0.005	0.20	44	290	520	ND
Phenol	108-95-2	ND	0.6	0.20	1.5	1.7	1.9	ND
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	0.24	0.0005	0.20	33,000	140,000	240,000	ND
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	0.167	0.0005	0.20	270,000	1,100,000	3,100,000	ND
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	0.34	0.0005	0.20	35,000	240,000	1,100,000	ND
Pyrene	129-00-0	ND	0.03	0.20	ND	ND	ND	860
Tetrachloroethylene (Perchloroethylene)	127-18-4	0.0021	0.006	0.20	49	66	76	ND
Toluene	108-88-3	ND	0.0097	0.20	11	15	17	ND
Toxaphene	8001-35-2	1.1	0.00035	0.20	1,700	6,600	6,300	ND
trans-1,2-Dichloroethylene (DCE)	156-60-5	ND	0.02	0.20	3.3	4.2	4.7	ND
Trichloroethylene (TCE)	79-01-6	0.05	0.0005	0.20	8.7	12	13	ND
Vinyl Chloride	75-01-4	1.5	0.003	0.20	1.4	1.6	1.7	ND